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NATIONAL SCREENING PROGRAMME FOR CONGENITAL HYPOTHYROIDISM

Ministry of Health Malaysia
2018

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FOREWORD

Congenital Hypothyroidism (CH) is one of the conditions occurring in newborns that could lead to morbidity. It is also one of the most common preventable cause of intellectual disability.

This condition may not be recognised or detected at birth, as infants may not have any apparent symptoms or signs. Treatment of children with CH should be as soon as possible, as late treatment will result in poor intellectual performance and delayed growth.

Thus, to ensure the growth and development of all children, Ministry of Health implemented the Congenital Hypothyroidism Screening Program for all newborns. Beginning 20 years ago in 1998 with only 5 hospitals, today more than 400 hospitals and clinics from both government and private health sectors are involved in the screening programme.

Revision of guidelines is a vital task, as each day, research shines new light on our understanding of human development and disease, technologies advance and new approaches are discovered. This current revision is in line with Paediatric Protocol, which includes revision of cut-off values and data collection format. This guideline for screening is meant for use by staff in hospital and health clinics.

I would like to congratulate the Child Health Sector from the Family Health Development Division for their hard work and commitment in ensuring this guideline is produced. My appreciation also to all who were involved in the development of this updated guideline.

Datuk Dr Noor Hisham bin Abdullah
Director General of Health
Ministry of Health Malaysia

FOREWORD

Congenital Hypothyroidism (CH) is one of the conditions requiring medical attention in newborns and the Ministry of Health initiated a screening programme in 1998 to ensure all newborn are screened for CH.

Congenital Hypothyroidism is a treatable condition and if addressed early, morbidity in the form of intellectual disability can be averted. The problem however lies in the fact that in most babies this condition may go unnoticed until they reach 2 months of age, and by then intellectual and growth impairment would have occurred. For these reasons, screening at birth was implemented to ensure early treatment is given.

The screening programme has been in place for 20 years and over the years increasing numbers of hospitals and health clinics have implemented the screening programme. Coverage for CH screening in participating hospitals is almost 100%, and over the years an average of 200 cases are identified and treated every year, thereby achieving the goal of the programme i.e. early detection and intervention of Congenital Hypothyroidism to prevent disability.

These achievements are the result of close networking and coordination between the Obstetric and Pediatric Departments, the laboratory staff and the staff in health clinics. The guidelines developed facilitate all involved to ensure smooth running of the programme and this guideline has been revised to ensure relevance by incorporating the new additions to CH screening in the Pediatric Protocol.

I would like to congratulate the Child Health Sector from the Family Health Development Division and all the technical group members for their hard work and commitment in ensuring this guideline is produced.

Dr Hajah Faridah Abu Bakar
Deputy Director
Division of Family Health Development
Ministry of Health Malaysia

TECHNICAL WORKING GROUP

Advisor : Dr Faridah Binti Abu Bakar
Deputy Director
Division of Family Health Development
Ministry of Health

Chairman : Dr. Aminah Bee Bt Mohd Kassim
Public Health Consultant
Child Health Sector
Division of Family Health Development
Ministry of Health

Members

1. Dr Irene Cheah
   Consultant Peadiatrics Neonatology
   Kuala Lumpur Hospital
2. Dr Chin Choy Nyok
   Consultant Pediatrician
   Tengku Ampuan Afzan Hospital, Kuantan, Pahang
3. Dr Chee Seok Chiong
   Consultant Peadiatrics Neonatology
   Selayang Hospital
4. Dr Fuziah Md Zain
   Consultant Pediatrician
   Putrajaya Hospital
5. Dato' Dr.Hjh. Zuraidah Bt Hj. Abd Latif
   Consultant Peadiatrics Neonatology
   Ampang Hospital
6. Prof. Dr. Wu Loo Ling
   Consultant Pediatric Endocrinoly
   University Kebangsaan Malaysia Medical Centre (UKMMC)
7. Dr. Rozita Bt. Ab. Rahman
   Public Health Consultant
   Child Health Sector
   Division of Family Health Development, Ministry of Health
8. Dr. Amy Nur Diyana Bt Mohamad Nasir
   Medical Officer
   Child Health Sector
   Division of Family Health Development, Ministry of Health
9. Dr. Siti Hafsah Bt Abdul Halim
   Medical Officer
   Child Health Sector
   Division of Family Health Development, Ministry of Health
10. Pn. Lidwina Bt Edwin Amir
    Health Matron
    Child Health Sector
    Division of Family Health Development, Ministry of Health

CONTENT

1. INTRODUCTION

1.1 WHAT IS CONGENITAL HYPOTHYROIDISM

Congenital hypothyroidism (CH) is defined as thyroid hormone deficiency, which is present at birth. However, this condition may not be recognised or detected at birth, as infants may appear normal with no apparent symptoms or signs seen.

Thyroid hormone deficiency at birth can be caused by abnormality in thyroid gland development (dysgenesis) or disorder of thyroid hormone biosynthesis (dyshormonogenesis) These two abnormalities lead to primary hypothyroidism. While, deficiency of thyroid stimulating hormone (TSH) leads to secondary or central CH. Another category in CH is peripheral hypothyroidism, which results from defects of thyroid hormone transport, metabolism or action.

Congenital hypothyroidism can be classifed as permanent or transient CH (Table 1). In permanent CH means there is a persistent deficiency of thyroid hormone and life-long treatment is required. Transient CH is defined as a transient abnormality of the thyroid function, which later normalises and may or may not require replacement therapy.

Table 1: Causes and Birth Prevalance of Neonatal Thyroid Dysfunction

Disorder	Prevalence
Permanent disorder	
1. Thyroid dysgenesis (agenesis, hypoplasia, ectopia)	1: 4,500
2. Thyroid dyshormonogenesis	1: 30,000
3. Hypothalamic-pituitary hypothyroidism	1: 100,000
4. Generalised resistance to thyroid hormone	Very rare
Transient disorder	
1. Transient hypothyroxinemia (mainly premature infants)	1:2000
2. Transient primary hypothyroidism (common in areas of iodine deficiency	Variable
3. Transient hyperthyrotropinemia (predominantly seen in Japanese population)	Very rare

Often babies with congenital hypothyroidism appear normal at birth. However, the early features include umbilical hernia, constipation, prolonged jaundice, poor feeding, inactivity and delayed bone age. Late features of untreated congenital hypothyroidism are macroglossia, coarse features, dry skin and hair, hoarse cry, delayed development, poor growth and mental retardation.

1.2 IMPORTANCE OF CONGENITAL HYPOTHYROIDISM SCREENING

Congenital hypothyroidism cannot be clinically detected at birth and it is the most common preventable cause of mental retardation. The child is usually discovered to have congenital hypothyroidism at around 2-6 months of age and by this time there already may be consequent brain damage. Recent prospective studies show that screening neonates and treating affected babies within the first week of life results, on average, in normal or near normal intellectual performance and growth at 6-12 years. Hence without a screening programme, most children with CH cannot be detected early and will be at risk of mental retardation .

Two cost-benefit analysis conducted in France and in the United States revealed overall cost-benefit ratio is between 1: 8.9 – 13.8 for screening congenital hypothyroidism (Layde et al, 1979 &Dhondt et al, 1991).

1.3 DEVELOPMENT OF CONGENITAL HYPOTHYROIDISM SCREENING PROGRAMME

In the past, priorities of children health care in Malaysia were focused on infectious diseases and curative services. Improvement in economy status and changes in lifestyle has led to the increase awareness of preventive issues in healthcare. Thus in 1991, paediatricians in Malaysia started the initiative to make CH as a national screening programme. Five studies were done in various part of the nation to understand the local situation of CH. Data from four of the studies described the birth prevalence of CH in Malaysia (Table 2). From the data, the "pooled" rate is 1:3029

Table 2: Birth prevalence of congenital hypothyroidism in Malaysia

Birth prevalence	Source
1 : 2410	Harun, 1992
1 : 2983	Ammar, 1997
1: 3666	Wu et al, 1999
1 : 3065	Mafauzy et al

Generally, the birth prevalence of congenital hypothyroidism appears to be higher in Malaysia when compared with Europe or America. There are three possible reasons for this higher prevalence:

1. Consanguinity, which is more common among certain ethnic groups in the region. However, the majority of cases are not due to inherited defects (thyroid dyshormonogenesis) but due to thyroid dysgenesis.

2. Transient primary hypothyroidism due to iodine deficiency. It is well recognised that iodine deficiency can affect the results of screening tests. Malaysia has, to varying degrees, the problem of iodine deficiency in Sabah and Sarawak and isolated district in Peninsular Malaysia.

3. This prevalence may possibly be reflecting the true genetic situation in the region.

In 1997, MOH initiated a national committee to look into the implementation of a national screening programme. A Health Technology Assessment was done to determine the safety, effectiveness and cost effectiveness of screening for CH. After one year of assessment, it was reported that a national screening programme for CH should be instituted. As a result, the national screening programme for CH officially started in October 1998 with the objective of screening all newborn for CH and managing them appropriately to prevent mental disability.

The first draft for national screening manual was prepared in October 1998 and the programme was commenced in three regional hospitals (Seremban, Klang, Ipoh) and one district hospital (Port Dickson). After 1 year, evaluation of the programme was done and MOH decided to further expand the programme throughout the whole nation. With the expansion of the programme more health facilities were involved (**Table 3**) and more newborn babies could be screened. To ensure that the programme ran smoothly a national guideline was developed named as 'Protocol for National Screening for Congenital Hypothyroidism ', which was developed in the year 2000 and revised in 2011.

Table 3: Number of health facilities involved in CH screening programme

Year	Number of hospital & clinic		Number of hospital with lab facility (analyser) for cord TSH	
	Government	Private	Government	Private
1999	10	0	NA	NA
2005	75	NA	25	NA
2008	104	16	25	NA
2012	117	94	NA	NA
2015	385	139	49	39

*NA: Not Available

Compared to other countries, Malaysia has chosen cord blood sampling as the sample collection method, due to;

1. Mobility of mother after the delivery of their children

2. Limited home visits by medical staff in the post-natal period especially in the urban settings

3. Difficult to get parents respond for a preventive programme (where blood collection is done on an apparently normal child).

4. Allows for a much higher coverage of infants as almost > 85% of deliveries were conducted in the hospitals or by trained personal at home,

5. Reduces the cost of screening as the mechanism for blood sample collection will be linked to the established cord blood screening programme for Glucose-6-phosphate dehydrogenase (G6PD) deficiency

6. Cord blood sampling is simple, non-invasive and offers the earliest postnatal diagnosis

The test strategy adopted in Malaysia is primary TSH measurement supplemented by T4 determination in borderline samples. Infants with elevated TSH values, and those with borderline values & low FT4, are recalled for testing. This approach does run the possibility of missing secondary and tertiary hypothyroidism (1:100,000 births). However, it is the least expensive option with the lowest recall rates (0.03 – 0.85). This screening approach is especially in view of the development of newer TSH assays (enzyme linked immunoassays, chemiluminescent assays and fluoroimmunoassays) which offer greater sensitivity and better separation beween normal and abnormal TSH values. Using a combined TSH and FT4 screening approach would be too expensive. Using a primary FT4 approach would involved a large recall of up to 2%.

2. NATIONAL CONGENITAL HYPOTHYROIDISM SCREENING PROGRAMME

2.1 Objective

a. General objective:
All newborns with congenital hypothyroidism will be detected early and managed appropriately to prevent mental disability.

b. Specific objectives:

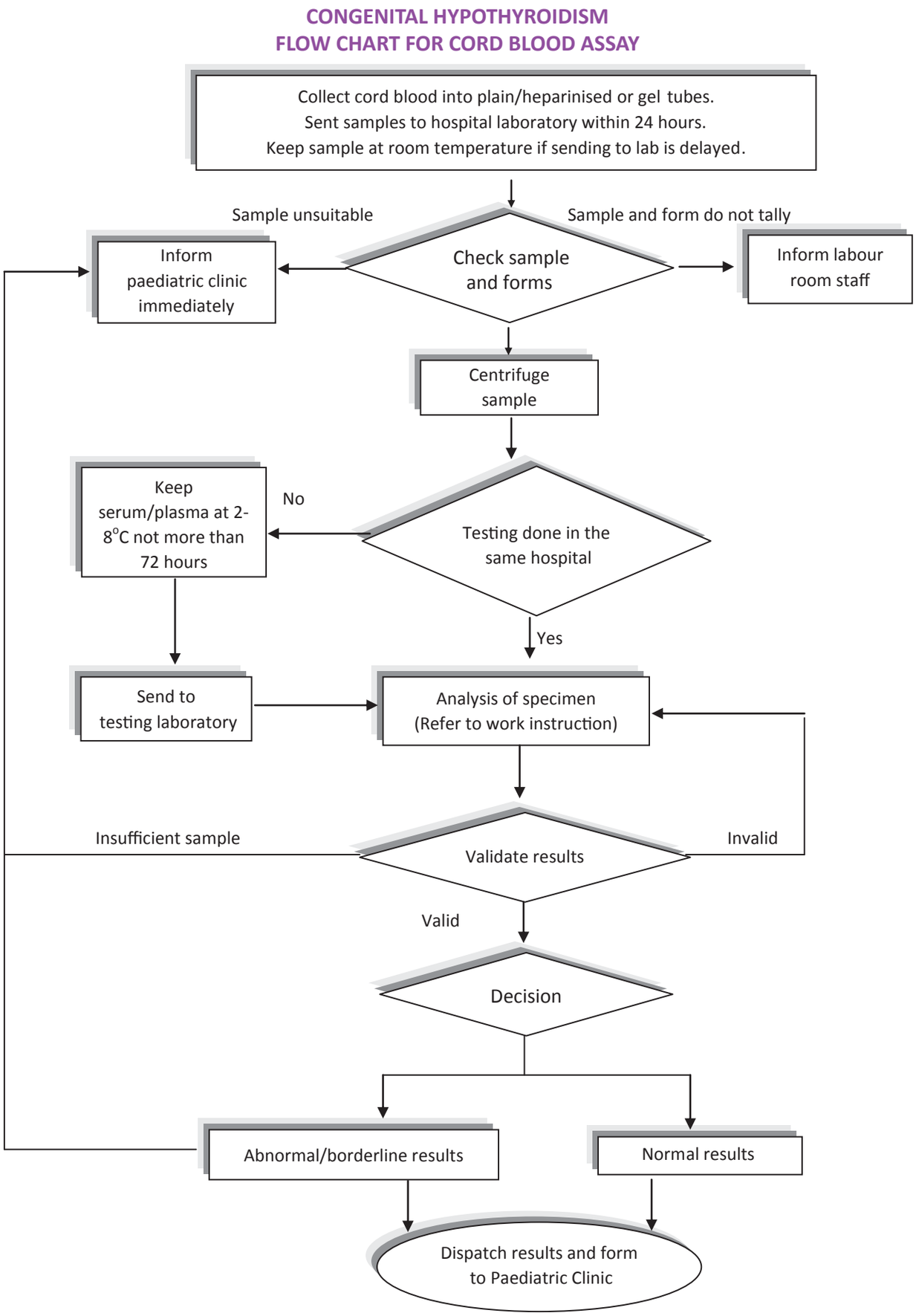
i. To screen all newborns for congenital hypothyroidism
ii. To ensure the use of appropriate screening technology which meets quality standards.
iii. To ensure all newborns with congenital hypothyroidism will receive treatment within the first 2 weeks of life
iv. To promote community awareness of congenital hypothyroidism

2.2 Methodology

a. Collection of Blood samples for TSH in Hospital

i. Immediately after delivery, clean maternal side of the cord with sterile gauze and collect the blood sample. **(Appendix 1)**
ii. Allow free flow of blood from the cord directly to the tube (if you need to 'milk', do it gently to prevent hemolysis)
iii. The tube should be filled with a minimum of 3ml of blood. (Allow space for the cap to be pushed in)
iv. Label the tube immediately. Complete investigation form.
v. Send the sample to the laboratory with the form at the normal routine intervals within 24 hours.
vi. For handling of blood samples at the laboratory; refer to **Flowchart 1**.

Flow chart 1: Handling of blood samples at the laboratory



b. Missed, Insufficient, Blood Clot Samples & Born Before Arrival Cases

i. If for some reason the blood sample has not been taken from the cord then it should be taken from the baby as soon as possible after the third day of life. This is to avoid the TSH surge that occurs ½ hour after birth to about 72 hours of age and to ensure early treatment before 2 weeks of life for better prognosis.

ii. Fill up the data collection form (**Appendix 2**) and send this to the Paediatric doctor in charge. In addition, give parents the instruction sheet and the date to return for a blood sample (after the 3rd day of life).

iii. The Paediatric Department is responsible to collect the blood sample. The blood sample collected after the 3rd day of life should be venous sample of at least 2mls.

2.3 Filling Up of Investigation Form (Appendix 2)

Labelling and completion of the data collection form are as follow:

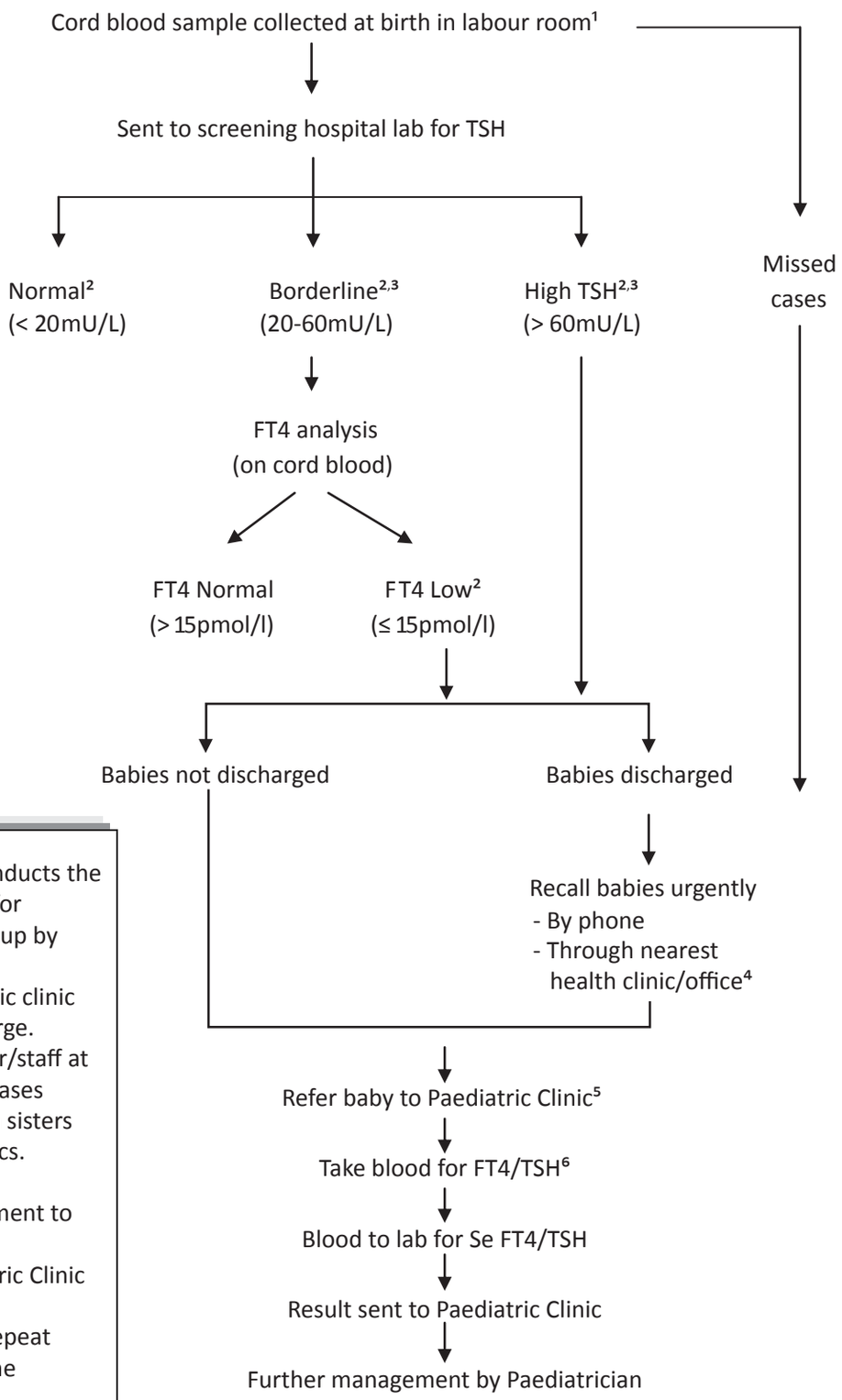
i. Biodata of the newborn as in item 1-8 should be filled in by labour room staff

ii. Items 9-10 are to be filled by the laboratory staff

2.4 Flow chart for investigation

Refer to flow chart 2 - 4

Flow chart 2: Screening for Congenital Hypothyroidism at Hospital **with** T4/TSH Screening Facilities



[1] Blood taken by staff who conducts the delivery. Investigation form for screening of TSH to be filled up by attending staff

[2] Result to be sent to paediatric clinic and compiled by staff in charge.

[3] Lab to inform relevant officer/staff at Pediatric Clinic to recall for cases either by phone or to inform sisters /PHN at health districts/clinics.

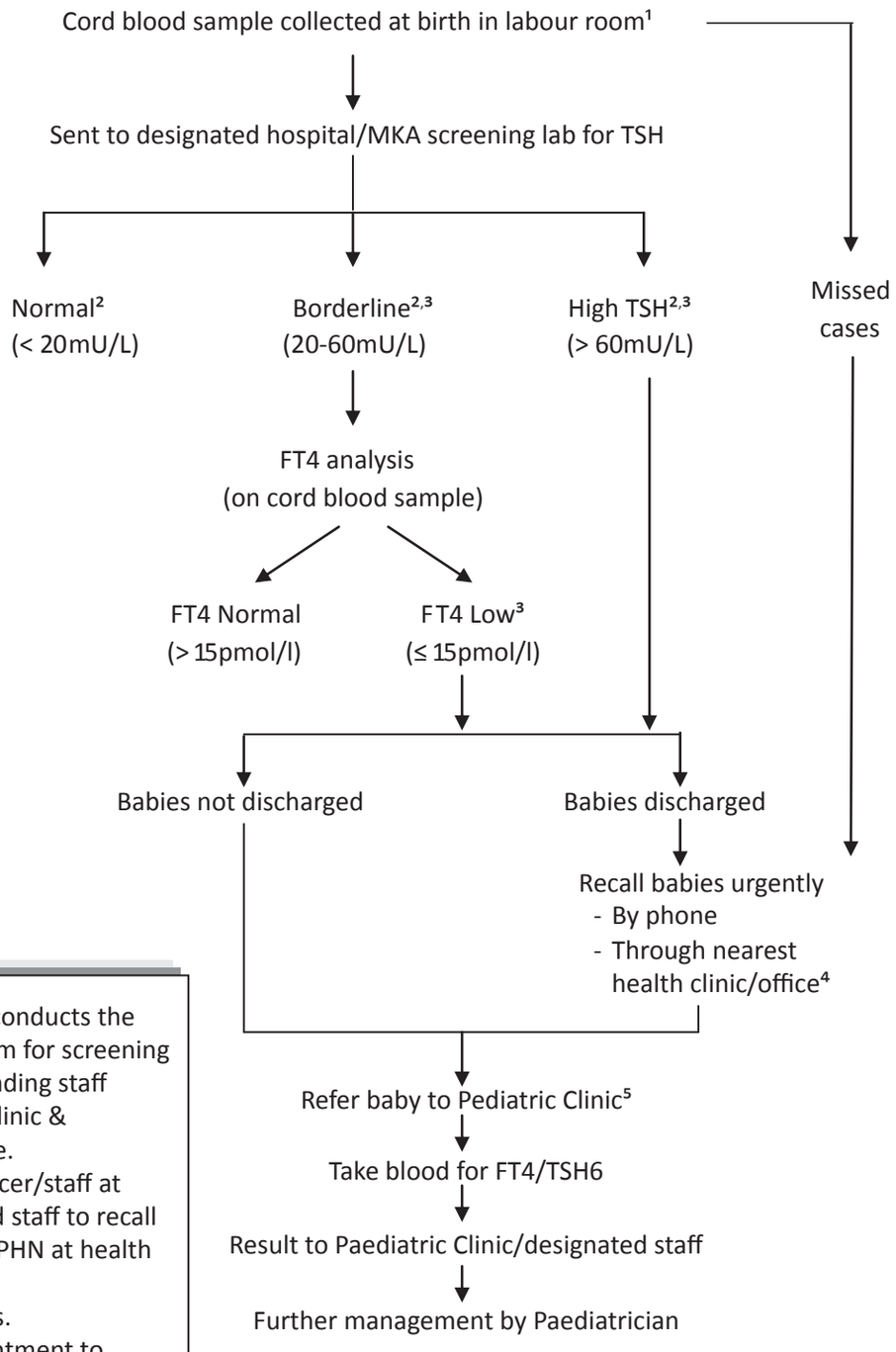
[4] Sister/PHN to recall babies.

[5] Urgent referral and appointment to pediatric clinic

[6] Blood to be taken at Paediatric Clinic

* For asphyxiated neonates, repeat screening test should be done after 3rd day of life when hemodynamically stable

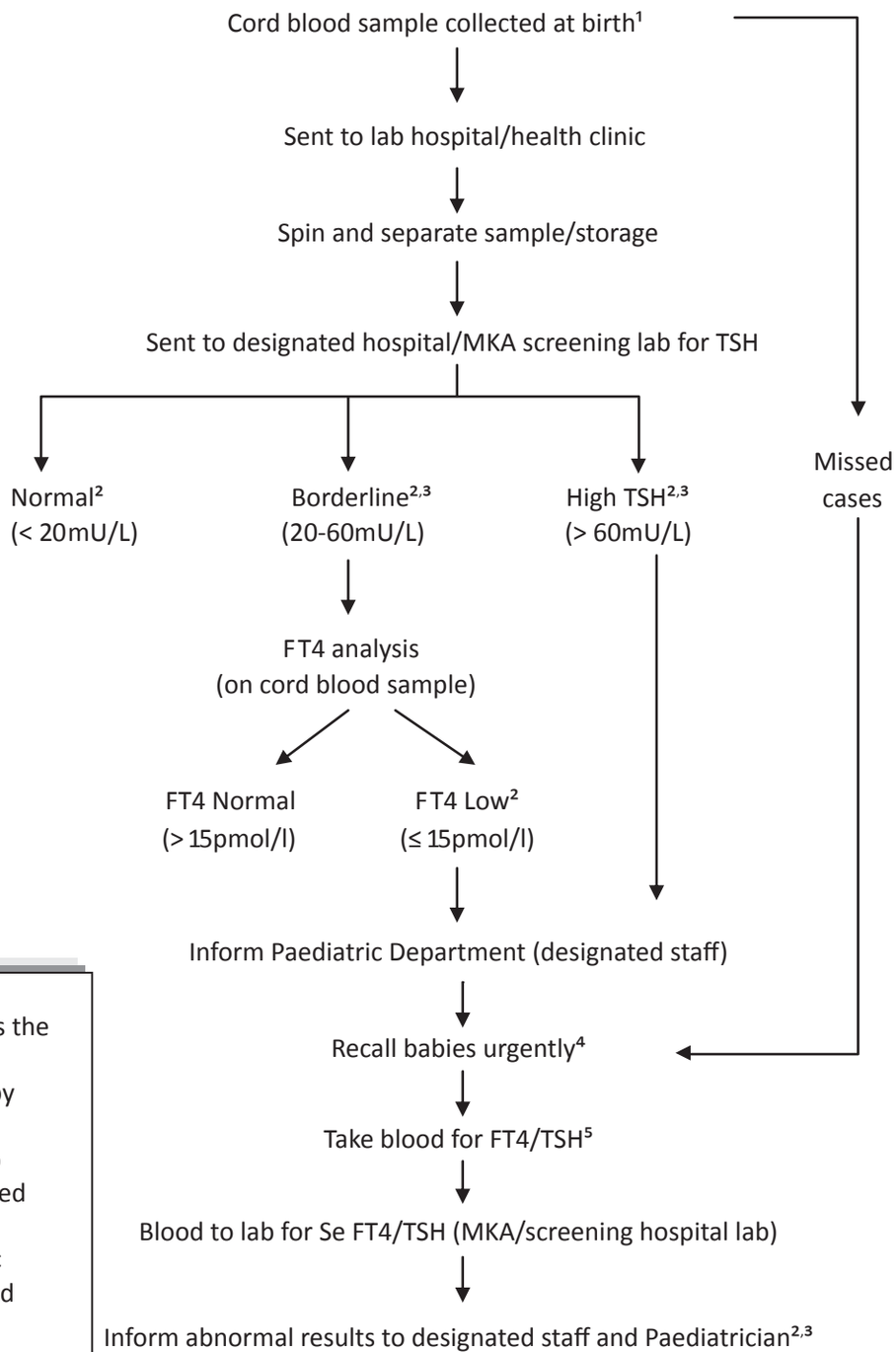
Flow chart 3: Screening For Congenital Hypothyroidism at Hospital **without** T4/TSH Screening Facilities



[1] Blood taken by staff who conducts the delivery. Investigation form for screening of TSH to be filled by attending staff
[2] Result sent to paediatric clinic & compiled by staff in charge.
[3] Lab to inform relevant officer/staff at Pediatric Clinic/designated staff to recall cases or to inform sisters/PHN at health districts/clinics.
[4] Sister/PHN to recall babies.
[5] Urgent referral and appointment to pediatric clinic
[6] Blood to be taken at Pediatric Clinic

* For asphyxiated neonates, repeat screening test should be done after 3rd day of life when hemodynamically stable

Flow chart 4: Screening For Congenital Hypothyroidism for Home/Health clinic/ Low Risk Birthing Centre Delivery



[1] Bloodtaken bystaff who conducts the delivery. Investigation form for screening of TSH to be filled up by attending staff

[2] Lab to inform abnormal result to Paediatric Department (designated staff) to recall cases

[3] All result to be sent to Paediatric Clinic and compiled by designated staff.

[4] Designated staff to make arrangement to recall babies.

[5] Blood to be taken at nearest hospital/health clinic.

2.4 Level of Cord TSH and FT4

Cord TSH level:

i. **NORMAL:** < 20mIU/L or use 97.5th percentile value as determine by the local laboratory or laboratory that used the same analyser:
ii. **BORDERLINE:** 20- 60 mIU/L
iii. **HIGH:** > 60 mIU/L

Cord FT4 level:

i. **NORMAL :** > 15pmol/l
ii. **LOW:** ≤ 15pmol/l

2.5 Retesting of Patients (Confirmation) and management

Blood samples for confirmation (re-testing) should be **venous samples** and should be taken from the baby **after the 3rd day of life**. This is to avoid the TSH surge that occurs from ½ hour after birth to 72 hours of age.

Babies for retesting are those with **high TSH** (> 60mIU/L) or **borderline TSH** (20-60mIU/L) **with low FT4** (≤ 15pmol/l).

3. MANAGEMENT OF CONGENITAL HYPOTHYROIDISM

3.1 Management Principles for Congenital Hypothyroidism

Hormonal therapy is available for congenital hypothyroidism. Every effort needs to be taken to confirm the diagnosis as soon as possible and to initiate treatment. With the cord blood screening programme most neonates with severe congenital hypothyroidism can be treated within the first 14 days of life.

The goal of therapy is to restore euthyroid state by maintaining a serum FT4 level at the upper half of the normal age-related reference range. Ideally serum TSH levels should be between 0.5-2.0mIU/L after the first month of life.

Subsequent review is at 4-6 weekly intervals during the first 6 months and at 2-3 monthly interval during the 6-18th month period to maintain serum FT4 levels in the normal range for age. Treatment is monitored by measuring FT4, TSH, bone age, growth parameters and psychomotor development. Parents need to be counseled that poor compliance in the infancy may cancel the benefits of screening.

Follow-up and Thyroid Function Tests

Suggested time interval for follow-up and thyroid function test is as in Table 4.

Table 4: Time interval for follow-up and thyroid function test

Age of patient	Intervals for Thyroid Function Test
After initiation of L-thyroxine	1-2 weeks (until normalization of results)
1- 6 months	1 - 2 monthly
6 months – 3 years	3 - 4 monthly
> 3 years until growth is complete	6 - 12 monthly
• **Should be more frequent if compliance is questionable or abnormal TFT values are obtained, and 4-6 weeks after any change in L-thyroxine dose/formulation**	

Follow-up Assessment

- Growth
- Development
- Mental and cognitive function
- Symptoms of over and under treatment
- Hearing test
- Bone age - normalization by 1-2 years

4. MONITORING AND EVALUATION OF THE NATIONAL CONGENITAL HYPOTHYROIDISM SCREENING PROGRAMME

It would be useful to have a computerised register of all neonates screened but this may not be possible in all centres. The simplest way to keep data for monitoring of the programme is for the Paediatrician in charge to keep a copy of ALL the screening forms (i.e. for normal children and those found to have abnormal TSH results)

The data listed below is use for monitoring of the programme:

1. Number of birth registered by month (from the labour room book)
2. Number of cases screened by month
3. Outcome of screening sample results by month (TSH high, borderline and low)
4. Number of children recalled for testing by month (TSH high and TSH borderline with low FT4)
5. Number of cases confirmed as congenital hypothyroidism
6. Number of confirmed cases treated within 14 days of life

Various QA indicators were made to ensure the quality of National Congenital Hypothyroidism Screening Programme, refer Table 5.

Table 5: QA Indicators for National Congenital Hypothyroidism Screening Programme

Monitoring Data	QA Indicator	Comments
1. Coverage of screening programme **=** No. of newborn screened (including BBA) per month x 100 No. of live births + BBA per months	**>99% for hospital**	Reflect process in labour room
2. Screening Sample rejection rate = No. of rejected sample x100 Total no. of screened sample received	**< 1%**	
3. Percentage of patients with abnormal results retested. = No. of patients with abnormal results retested x 100 Total number recalled back ** Patient with abnormal results = High TSH + Borderline TSH with low FT4	**100%**	Reflects process in Paeds.
4. Duration from birth to treatment of confirmed cases <14 days	**100%**	
5. Total turn around time (for lab) Time from collection of sample to despatch of result to Paediatric Department should be <2 working days (to be monitored 6 monthly)	**>90%**	Birth ↓ Collection ↓ Despatch to Lab ↓ Received at lab ↓ Analysis ↓ Despatch to paeds
6. External Quality Assurance Programme	**All Screening lab**	
7. Internal QC Long term QC monitoring to report CV of IQc Involving 1 year QC data/QC data of the same lot number and calculation of total error and MU	**All Screening lab**	

Table 6: Data collection at each screening center (Hospital/ KK /LRBC)

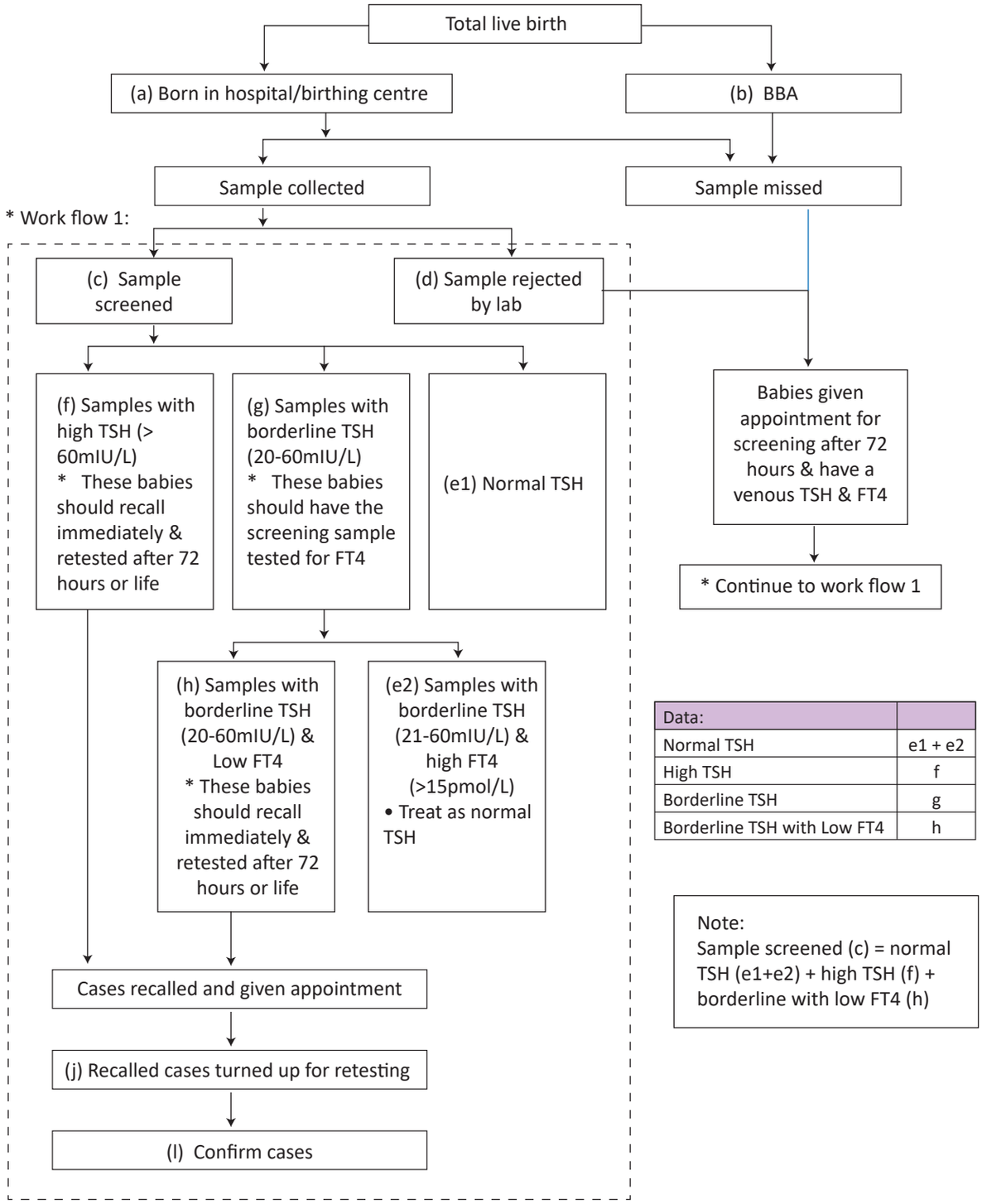
	Year : _____ **Month : _____**	J	F	M	A	M	J	J	A	S	O	N	D	Total
a	No. of live births at hospital/KK													
b	No. live birth as BBA													
c	No. samples screened													
d	No. samples rejected													
e	No. of normal TSH													
f	No. samples with high TSH													
g	No. samples with borderline TSH													
h	No. samples with borderline TSH and low FT4													
i	No. needing retesting (f+h)													
j	No. of abnormal result retested													
k	Actual recall rate ; (i/c)x 100													
l	No. of confirmed cases													
m	No. of confirmed cases treated < 14 days													

Notes:
1. Refer to Table 7 at page 22 for definition of data collection
2. Refer to Flow Chart 5 at page 23 for data collection flow

Table 7: Definition Data collection at each screening center

	Variables	Definition
a.	No. of live births at hospital/KK	No. of live births in participating hospital/clinics
b.	No. live birth as BBA	No. of live births born before arrival to the hospital/clinic
c.	No. samples screened	No. of samples screened include: i) Cord blood TSH for live birth at hospital/KK ii) Venous blood after 72 hours of life for babies whom cord blood not taken during delivery/BBA babies not taken cord blood/ rejected Cord TSH samples
d.	No. samples rejected	Samples unable to be processed by lab (analyser) *example: sample hemolysed/mucoid/inadequate/wrong label/wrong container
e.	No. normal TSH	No. of screened samples with result of TSH < 20 mIU/L
f.	No. samples with high TSH	No. of screened samples with result of TSH > 60 mIU/L
g.	No. samples with borderline TSH	No. of screened samples with results of borderline TSH 20 - 60 mIU/L
h.	No. samples with borderline TSH and low FT4	No. of samples with borderline TSH 20 - 60 mIU/L and low FT4 < 15pmol/L * the same sample of borderline TSH will proceed with further testing for T4
i.	No. needing retesting (f+h)	No. of samples with abnormal results which needed retesting (samples with TSH > 60mIU/L + samples with borderline TSH and low FT4 < 15pmol/L)
j.	No. of abnormal result retested	No. of samples with abnormal results (TSH > 60mIU/L and borderline TSH and low FT4 < 15pmol/L) which **were retested** after 72 hours of life
k.	Actual recall rate ; (i/c)x 100	No. needing retesting / total no. of sample screened x 100%
l.	No. of confirmed cases	No. of cases confirmed to have Congenital Hypothyroidism
m.	No. of confirmed cases treated < 14 days	No. of confirmed congenital hypothyroidism who received treatment within 14 days of life

Flow Chart 5: Data collection flow at screening center (Hospital/KK/LRBC)



Data:	
Normal TSH	e1 + e2
High TSH	f
Borderline TSH	g
Borderline TSH with Low FT4	h

Note:
Sample screened (c) = normal TSH (e1+e2) + high TSH (f) + borderline with low FT4 (h)

Table 8: Data collection at state level and national level

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
i.	No. live birts at hospital/KK													
	(KKM)													
	(private&university)													
ii.	No. live birth as BBA													
	(KKM)													
	(private&university)													
iii.	Total no. of live birth (i+ii)													
	(KKM)													
	(private&university)													
iv.	No. samples screened													
	(KKM)													
	(private&university)													
v.	% samples screened													
	(KKM)													
	(private&university)													
vi.	No. rejected samples													
	(KKM)													
	(private&university)													
vii.	No. normal TSH													
	(KKM)													
	(private&university)													
viii.	No. samples with high TSH (>60mIU/L)													
	(KKM)													
	(private&university)													
ix.	No. samples with borderline TSH (21-60mIU/L)													
	(KKM)													
	(private&university)													
x.	No. samples with borderline TSH (21-60mIU/l) and low FT4 (≤ 15pmol/L)													
	(KKM)													
	(private&university)													
xi.	Total no of result collected													
	(KKM)													
	(private&university)													

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
xii.	Missing results													
	(KKM)													
	(private & university)													
xiii.	No. of needing retesting (viii+x)													
	(KKM)													
	(private & university)													
xiv.	Actual recall rate - (xiii/iv) x 100													
	(KKM)													
	(private & university)													
xv.	No. of abnormal result retested													
	(KKM)													
	(private & university)													
xvi.	No. of confirmed cases													
	(KKM)													
	(private & university)													
xvii.	No of confirmed cases treated < 14 days													
	(KKM)													
	(private & university)													
xviii.	% treated < 14 days of life													
	(KKM)													
	(private & university)													
xix.	No. hospital & klinik involved in blood sampling and return collection													
	KKM hospital													
	KKM clinic													
	Private/university hospital													
	Private/university clinic													
xx.	No. of hospital with lab facility (analyser) for cord TSH													
	(KKM)													
	(private & university)													

Table 9: Definition Data Collection at State and National Level

Definitions of variables

Facilities	Definition
(KKM)	For **KKM** hospital/clinics/ABC
(private & university)	For **PRIVATE and UNIVERSITY** hospital/maternity centres/clinics

	Variables:	Definition
i.	**No. live birts at hospital/KK**	No. of live births in participating hospital/clinics
ii.	**No. live birth as BBA**	No. of live births born before arrival to the hospital/clinic
iii.	**Total no. of live birth (i+ii)**	Total no. of live births in the participating hospital/clinic (AUTOCALCULATED)
iv.	**No. samples screened (total)**	No. of samples screened include: i) Cord blood TSH for live birth at hospital/KK ii) Venous blood after 72 hours of life for babies whom cord blood not taken during delivery/BBA babies not taken cord blood/ rejected Cord TSH samples
v.	**% samples screened**	no. of samples screened/total no. of live birth in the participating hospital x 100% (d/c x 100) (AUTOCALCULATED)
vi.	**No. rejected samples**	Cord blood samples unable to be processed by lab (analyser) *example: sample hemolysed/mucoid/inadequate/wrong lable/wrong container
vii.	**No. normal TSH**	No. of screened samples with result of TSH < 20 mIU/L
viii.	**No. samples with high TSH**	No. of screened samples with result of TSH > 60 mIU/L
ix.	**No. samples with borderline TSH**	No. of screened samples with results of borderline TSH 20 - 60 mIU/L
x.	**No. samples with borderline TSH and low FT4**	No. of screened samples with resultss of borderline TSH 20 - 60 mIU/L and low fT4 < 15pmol/L on further testing * the same sample of borderline TSH will proceed with further testing for T4
xi.	**Total no of result collected**	vii + viii + x (AUTOCALCULATED)
xii.	**Missing results**	(iv - xi) (AUTOCALCULATED)
xiii.	**No. of needing retesting (viii+x)**	No. of sample with abnormal result which needed retesting (sample with TSH > 60mIU/L + samples with low FT4 ≤15pmol/L) (AUTOCALCULATED)
xiv.	**No. of abnormal result retested**	No. of samples with abnormal results (TSH > 60mIU/L or borderline TSH AND low FT4 ≤ 15pmol/L) which were retested after 72 hours of life
xv.	**Actual recall rate - (xiii/iv) x 100**	No. of needing retesting (abnormal result) / total no. of cord blood screened x 100%

	Variables:	Definition
xvi.	**No. of confirmed cases**	No. of cases with confirm diagnosis of Congenital Hypothyroidism
xvii.	**cases treated < 14 days**	No of confirmed congenitel hypothyroidism who received treatment within 14 days of life
xviii.	**% treated < 14 days of life**	No. of comfirmed cases treated < 14 days of life/ No. of confirmed cases x 100% (xvii/xvi x 100%)
xix.	**No. hospital & klinik involved in blood sampling and return collection**	No. of hospital participate in the screening program (collects TSH samples and submit returns)
xx.	**No. of hospital with lab facility (analyser) for cord TSH**	No. of hospitals with lab facilities (analyser for TSH)

Table 10: Data collection for comfirmed case by states

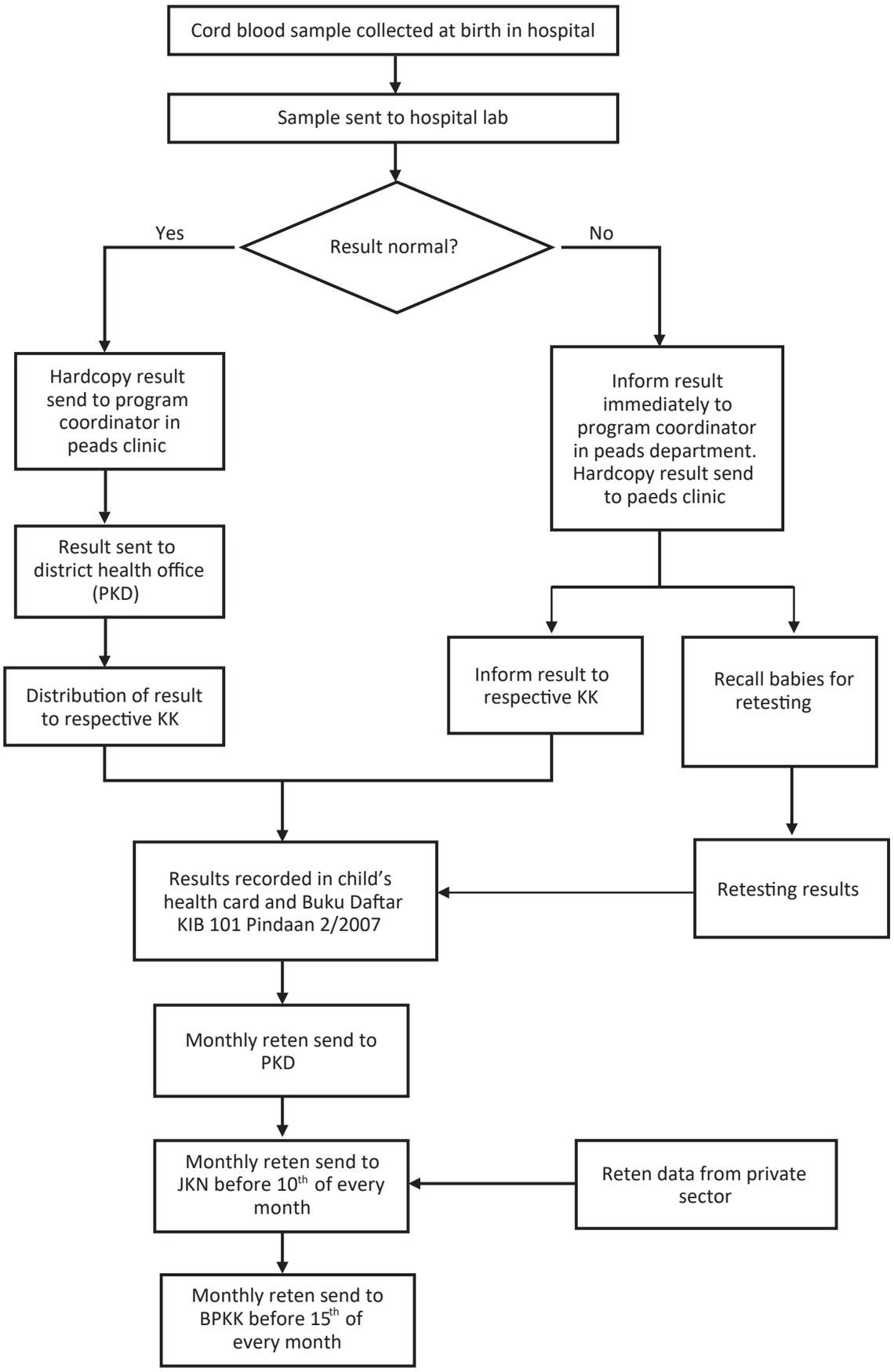
Confirmed case report

STATE : **YEAR:**

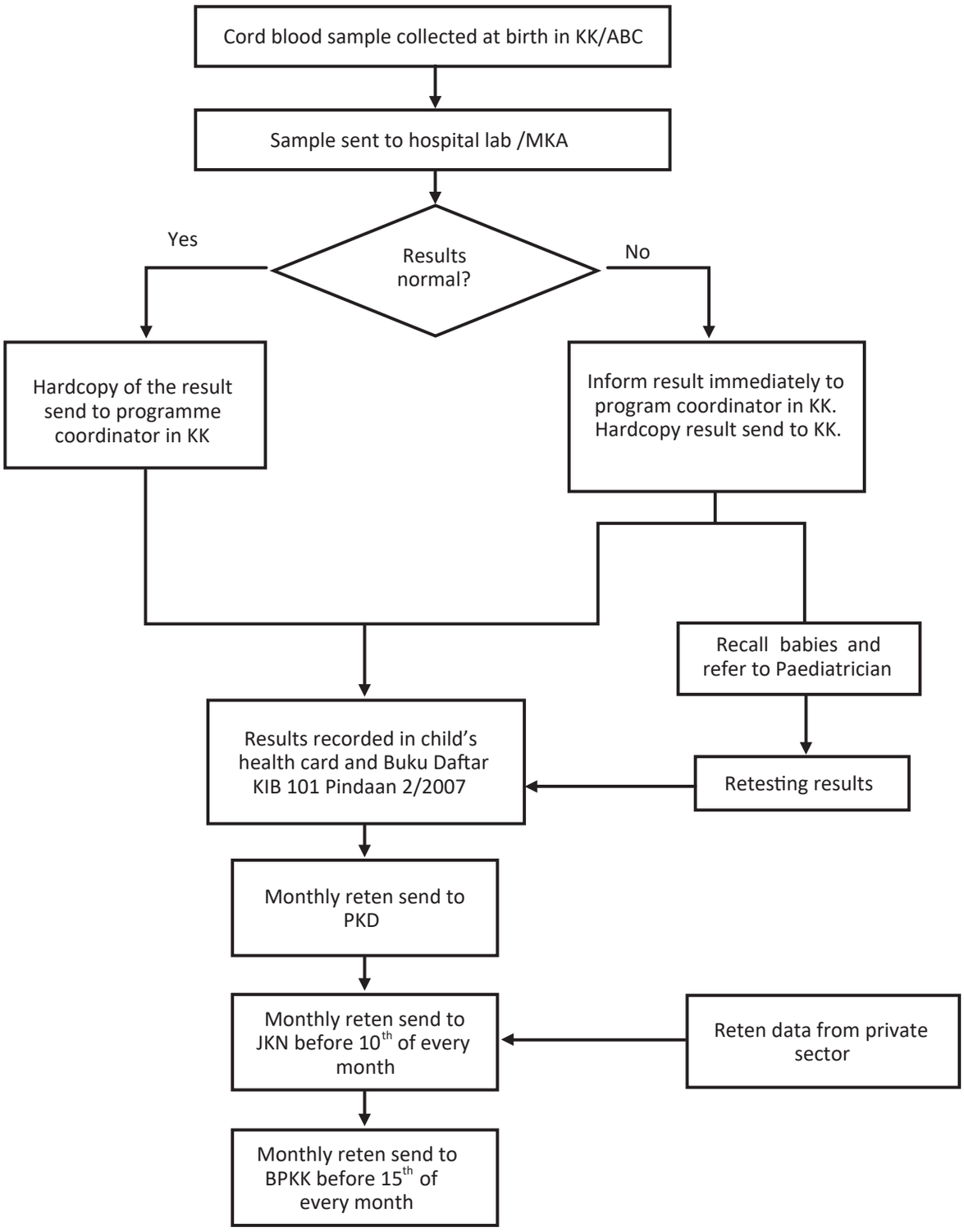
MONTH:

No.	Name	Hospital	RN	DOB	Date of 1st sample / result		Date of repeat sample/ result		Date of diagnosis	Date started treatment	Duration from birth to treatment	Remarks
					Date of sample taken	Date of result	Date of sample taken	Date of result				
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

Flow chart 6: Monthly reten flow from Hospital



Flow chart 7: Monthly reten flow from Health clinic/Alternative Birthing Centre Delivery



5. RESPONSIBILITIES OF DEPARTMENTS INVOLVED

Administrative Department

1. Printing of investigation form

Obstetric Department/Labour Room

1. To assign staff responsible for coordination Congenital Hypothyroidism Screening
2. To indent investigation form and test tubes
3. Collection of specimen
4. Fill up investigation form
5. Dispatch of specimen to the laboratory
6. Record number of specimen taken/not taken (with reason)
7. BBA cases – explain to mothers regarding the screening, fill up the investigation form and to get appointment for mothers to take the baby to paediatric clinic
8. Antenatal education

Pathology Department

1. Puchasing of reagents and comsumables
2. Receiving specimen and keep records
3. Perform laboratory investigation /procedure
4. Inform cases that need to be recalled (high/borderline TSH with low FT4 and rejected samples) to paediatric clinic/designated staff
5. Dispatch all results to Peadiatric Clinic/designated staff
6. To participate in External Quality Assurance Programme

Paediatric Department

1. Coordination of the screening programme
2. Collection of all results
3. Recall of cases for high/borderline TSH with low FT4 and rejected samples
4. Further management of cases
5. Handle BA cases (liaise with post-natal ward)
6. Monitoring and evaluating of the programme with QA indicators
7. Annual return of the programme to State Health Department (via State Paediatrician)

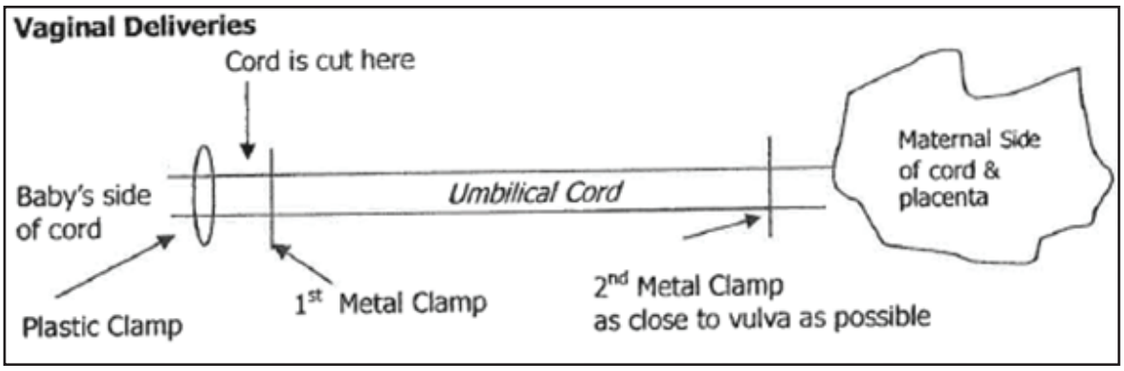
State Health Department

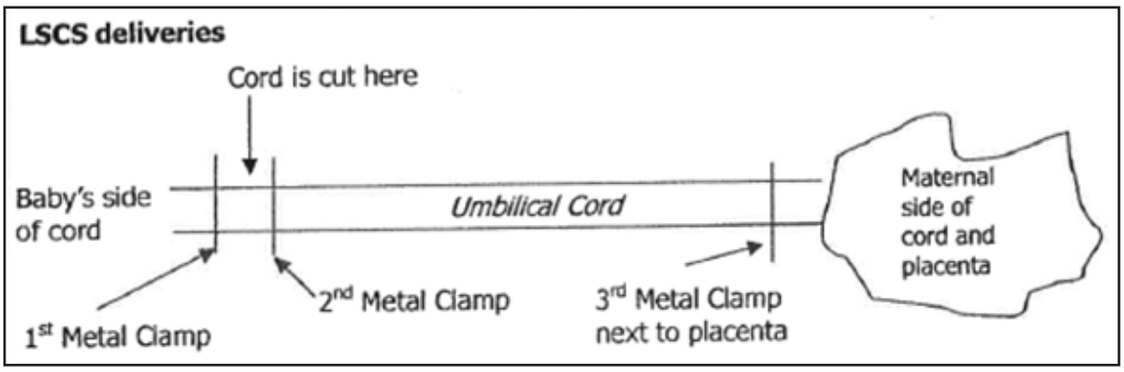
1. To set up Congenital Hypothyroidism committee at state level
2. Assist in recalling babies and follow up
3. To establish mechanism for documenting results in Child Health Home-based Card
4. Monitoring and evaluation of the overall programme
5. Budget
6. Planning
7. To finalized return and submit to Family Health Development Division, MOH
8. Responsible for public health education
9. Responsible for training for screening programme (eg: blood collection)

APPENDIX

Appendix 1

Blood for TSH (Thyroid Stimulating Hormone) evaluation should be collected immediately after birth from the maternal side of the cord. From studies done in Singapore and Finland, it is noted that there is a rapid admixture of maternal blood and foetal blood in the placenta immediately after births. This means that the TSH from cord blood can be çontaminated by maternal TSH levels. To overcome this problem, we would like cord blood to be collected for TSH in the mammer described below:





Please note:

1. For vaginal deliveries, the 2nd metal clamp is applied to the umbilical cord as close to the vulva as possible. Only blood between the 1st and 2nd metal is to be collected for TSH. Even if the volume of blood is small (ie. <10mls), do not tempted to release the 2nd metal clamp.

2. For LSCS deliveries (where the plastic clamp is not used), please apply a 3rd metal clamp or artery forceps to the umbilical cord just before the placenta. Collect blood for TSH from the segment of cord between 2nd and 3rd metal clamps. Even if the volume of blood is small (ie. <10mls), do not tempted to release the 3rd metal clamp.

Appendix 2

Ref No. | | | | | |

CONGENITAL HYPOTHYROIDISM CORD BLOOD SCREENING TEST
HOSPITAL _____

Items 1-8 are to be filled in by labour room staff	
1. Mother's IC number:	2. RN:
3. Mother's name:	
4. Home Address: a) Permanent address	b) During confinement period/maternity leave
5. Home Telephone No:	Hand phone No :
6. Place of birth:	7. DOB: Time:
8. Date sample taken:	
Items 9-10 are to be filled in by laboratory staff:	
9. Date sample received:	
10. Result : a) TSH (mIU/l) :	b) FT4 (pmol/L)

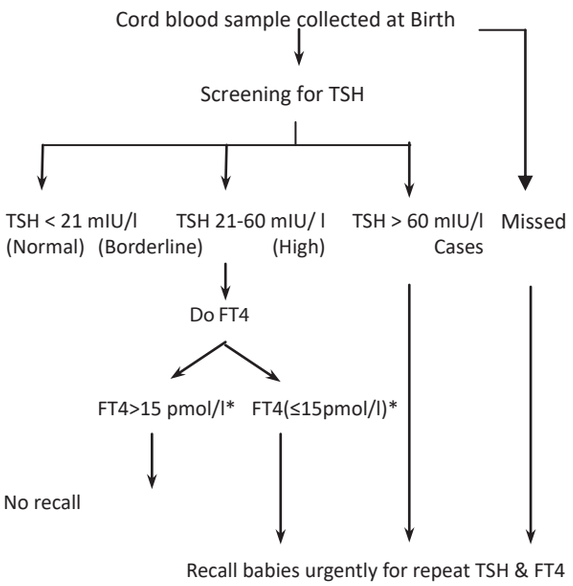
Collection of blood samples for TSH in hospital

i) Immediately after delivery, clean the maternal side of the cord with a sterile gauze and collect the blood sample.(Appendix 1)
ii) Allow free flow of blood from the cord directly to the tube (if you need to 'milk', do it gently to prevent hemolysis).
iii) The tube should be filled with a minimum of 3 ml of blood.
(Allow space for the cap to be pushed in)
iv) Label the tube immediately. Complete the investigation form.
v) Send the sample to the laboratory with the form at the normal routine intervals within 24 hours.
vi) See flow chart 1 for the handling of blood samples at the laboratory.

Missed, Insufficient, Blood Clot Samples & Born Before Arrival Cases

i) If for some reason the blood sample has not been taken from the cord then it should be taken from the baby as soon as possible after the third day of life. This is to avoid the TSH surge that occurs from ½ hour after birth to about 72 hours of age and to ensure early treatment before 2 weeks of life for better prognosis.
ii) Fill up the data collection form (Appendix 2) and send this to the Paediatric doctor in charge. In addition give parents the instruction sheet and the date to return for a blood sample (after the 3rd day of life).
iii) The Paediatric Department is responsible to collect the blood sample. Blood samples collected after the 3rd day of life should be venous samples of at least 2 mls.

Flow of Investigations



*Note:
Lab is encourage to determine own 97.5th percentile (use log TSH for its determination) for TSH to be used as cut off value

REFERENCE

1. Hall DMB, Michel KM. Screening in infanvy. Arch DS Child 1995; 72:93-96. The 1968 WHO criteria for screening by Wilsoon & Junger is reproduce in this article

2. Harun F Ch'ng SL. Congenital hypothyroidism in a developing country. Proceedings of clinical Thyroidology Meeting, Innsbruck, Austria 1992. Sample size 19,281 (7 detected cases)

3. Amar HSS, Jai Mohan. Screening for Congenital Hypothyroidism: A Regional Pilot Project. Health Systems Research Report 1997, Ipoh Hospital, Malaysia. Sample size 8,950 (3 detected cases)

4. Wu LL, Sazali BS, Adeeb N, Khalid BAK. Congenital hypothyroidism screening using cord blood TSH. (submitted for publication 1998) Sample size 11,000 (3 detected cases)

5. Mafauzy M, Choo KE, et al. Neonatal screening for congenital hypothyroidism in N-E Pen. Malaysia. J of AFES, vol 13 (no. 1 & 2):35-37. Sample size 12,261 (4 detected cases)

6. Amar HSS. Congenital Hypothyroidism Screening In South East Asia. J Pediatrics, Obstetrics & Gynaecology Jan/Feb 1997; 1Pg.1-6

7. Amar HSS, Logan S. Audit screening for congenital hypothyroidism (letter) Arch Ds Child 1993; 68:432-433

8. Fisher DA. Status Report: Screening for Congenital Hypothyroidism. Trends ENdoccrinol Metab 1991;2(4): 129-133

9. Information and documentation system unit, planning and development division, Ministry of Health, Malaysia. February 1998

10. Amar HSS. Screening for congenital hypothyroidism: The Argument for a National Programme in Malaysia. Malaysia J Child Health Dec 1994; Vol 6(2): 70-79

11. Barnes ND. Screening for vongenital hypothyroidism: the first decade. Arch Ds Child 1985; 60: 587-92

12. American Academy of Pediatrics Section on Endocrinology and Committee on Genetics, and American Thyroid Association Committee on Public Health. Newborn screening for Congenital Hypothyroidism: Recommended Guideline. Pediatrics 1993;91(6): 1203-1209

13. John R. Screening for Congenital Hypothyroidism. Ann Clin Biochem 1987, 27: 1-12

14. Amar HSS, Kuan GL, Sivalal S, Harun F, Wu LL, Rohana I, Jaudin R. Health Technology Assessment of congenital hypothyroidism screening programmes. Evidence based review, HTA unit, Ministry of Health Report March 1999

15. Dattani M.,Brook CGD., Outcomes of neonatal screening for congenital hypothyroidism, Current Opinion in Pediatric 1996, 8-389-395

16. Tanlek, Kaur P. Late Diagnosis of Congenital Hypothyroidism. Proceeding of Congress of Pediatrics, June 1994, Malaysia

17. Layde PM, Allmen Sor, Oakley GP, Congenital Hypothyroidism Control Programme-A Cost Benefit Analysis, JAMA 1979

18. Dhont JL, Farriaux JP, Saily JC, Lemrum R, Economic Evaluation of Cost-Benefit ratio for Phenylketonuria and Hypothydroidism. Journal of Inherited Metabolic Disease, 1991

19. Rastogi and LaFranchi. Orphanet Journal of Rare Disease 2010, 5: 17