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1) Introduction

The **Workshop to Establish a Urinary Iodine Laboratory Network** was organized in Bangkok, between 22nd and 25th May 2001, by the Institute of Nutrition, Mahidol University, in association with Centers for Disease Control and Prevention (CDC), Atlanta, World Health Organization (WHO), United Nations Children's Fund (UNICEF) and the Micronutrient Initiative (MI) with other participants being ICCIDD and PAMM. The workshop's aim was to focus attention on the establishment of a network of International Resource Laboratories for Iodine (IRLI).

This workshop was the first in a series of workshops in strengthening the capacity of laboratories around the world to accurately measure iodine in urine and salt. One of the outcomes of the workshop was the formation of regional, national and subnational networks to serve as resource centres for their respective areas. These networks were envisaged to be a part of a technically harmonized network tied to one accuracy base, which would enable the comparability of results across regions and programs.

As a follow up to the Bangkok workshop, the **ICCIDD South East Asia Regional Office**, in collaboration with the **World Health Organization South East Asia Regional Office (SEARO)** and the **All India Institute of Medical Sciences** organized an inter-country workshop on 'Iodine Monitoring, Laboratory Procedures and National IDDE Programmes'. In the South East Asian region context, the workshop was relevant because there was long felt a need to have a national network to monitor the iodine content of salt and the urinary iodine excretion. There are many independent laboratories conducting both the salt and urinary iodine analysis, but the system for providing regular exchange of samples between the laboratories was required. One of the important issues which were discussed in the workshop included setting up of

standardized internal and external quality control protocols, regardless of the methods of estimation being used.

There is a need for quality epidemiological data in terms of salt iodine and urinary iodine depends on the laboratory practices and methods that conform to international standards. With the presence of the trained laboratory managers and other technical professionals in the key centres in the country, and thereby in the region, who can further train others in the sub-national / regional laboratories, the goal of decentralized capacity building will be fulfilled.

The policy issues involved in the establishment of a urinary iodine laboratory network are multisectoral. The guiding principle in the elimination of IDD in the world should be sustainability, with the integration of the Iterative loop into the social process model ("The Wheel"), to ensure its viability.

As most countries in the world are going through a transition phase, the indicators to measure iodine deficiency status have a complex relationship. It is, therefore imperative that there is an availability of representative, reliable data to better track the progress of the programmes through adequate quality control and quality assurance measures. The present workshop was a step forward towards fulfilling the objectives of sustainability. The list of participants for the present workshop is enclosed as **Annexure – 1**.

The workshop was initiated with an inaugural session on September 17, 2002.

2) Inaugural Session

The Chief Guest of the Inaugural session was **Prof. P K. Dave**, Director of the All India Institute of Medical Sciences, the host institution. The Guest of Honor was **Prof. N.K. Ganguly**, the Director General of the Indian Council of Medical Research, the premier medical research body in India.

The guests and invitees were welcomed by **Prof V P Reddaiah**, Head, Centre for Community Medicine, All India Institute of Medical Sciences. **Prof. M.G. Karmarkar**, Senior Advisor, ICCIDD outlined the broad aims and objectives of the workshop. **Dr. Keith Bentley** from the World Health Organization talked about the need for monitoring and laboratory procedures in IDD Elimination Programs. **Dr. R. Sankar**, National Programme Officer, the Micronutrient Initiative, summarized the role of the Micronutrient Initiative in elimination of Micronutrient Malnutrition. **Prof. P.K. Dave** spoke about the historic association between the All India Institute of Medical Sciences and the National Goitre Control Program and the need to sustain the elimination efforts through constant monitoring. **Prof. N.K. Ganguly** talked about the need for collaboration in public health programs. He exhorted the audience to make an effort to inform the community about the benefits of consuming iodised salt. **Dr. C.S. Pandav** gave the vote of thanks.

3) Workshop Program

18th September 2002

The participants were handed a workshop kit, which contained, apart from the conference stationery, the conference background papers related to urine and salt iodine estimation and a laboratory manual. The session started with the screening of the film 'Trishna', made by a documentary filmmaker, **Late Mr. Ishwar Chandra Pandey**, who tragically lost his life during the film shoot. The film was commissioned by the Union Ministry of Health as an audio-visual module to sensitize people on iodine deficiency disorders.

This was followed by country presentations from the participants. **Prof Quazi Salamatullah** from Bangladesh presented the history of IDD elimination efforts in Bangladesh. **Dr Renuka Jayatissa** presented data from a recent survey conducted in Sri Lanka. **Dr S Ranganathan** presented the research activities from the National Institution in Hyderabad. The Institute is presently in the midst of a national survey where a specific district from each state in the country is being surveyed to assess the impact of the iodised salt program. **Dr Arun Kumar Aggarwal** from PGI Chandigarh presented the data from the IDD survey being carried out in the northern region of the country. **Dr Bimal Rai** from the Ministry of Health in Sikkim made a presentation of the IDD Control Program in Sikkim, where he talked about the components of an effective program.

As part of the course work, the participants were asked to prepare the country specific project proposals, which details would then be discussed in later sessions.

The presentation of the participants is enclosed separately in a bound volume.

19th September 2002

Prof Karmarkar had an interactive session with the participants where they discussed the physiology and biochemistry of the thyroid hormones. The structure and mechanism of thyroid hormone was discussed in detail as well as the molecular mechanism of causation of iodine deficiency. He then talked about ecological iodine deficiency, a disease of the soil and explained the various causes causing an environmental deficiency of iodine. **Dr Denish Moorthy** elucidated on the spectrum of iodine deficiency and its consequences, the global and regional epidemiology of iodine deficiency, the means to eliminate iodine deficiency, the indicators for tracking progress towards sustaining elimination of iodine deficiency disorders and the interpretation of the indicators to assess the IDD status in a community.

Using the **Kerala survey** as a model, Dr Denish Moorthy introduced the participants to the survey methodology, the process of involvement of the stakeholders, the practical problems encountered during field survey, sample collection and storage, data analysis and interpretation and the management of an IDD Survey. The importance of monitoring in IDD elimination programs and the relevance of the laboratory indicators (urinary iodine excretion and iodine content of salt) was discussed. The concept of cyclical monitoring and the case study of Bhutan, where cyclic monitoring has been introduced with great success, were analysed.

The handouts during the workshop theory classes covered the topics discussed during the classes.

Estimation of Iodine in salt

The participants were familiar with the basic principles of laboratory procedures for iodine estimation in salt. The chemical basis for the laboratory test was explained in detail. This was a refresher class in the theory behind the practical. The concepts of

internal and external quality assurance, the maintenance of records and registers and the precautions to be taken while handling the chemicals, the glassware and the instruments were detailed. The importance of a Levy Jennings plot for maintenance of internal quality control was explained.

The venue shifted to the laboratory where the preparation of reagents was done. The participants prepared Sodium thiosulphate, 2N Sulphuric acid and Potassium iodide. **Prof M G Karmarkar** and **Dr Denish Moorthy** took some known value samples and gave a practical demonstration of the procedure. The participants learnt to use the automatic dispenser, the automatic burette and also the precautions to be taken while performing the salt analysis.

20th September 2002

Self Performance of Salt Iodine Estimation

Eight samples of the known value sample pool were provided to the participants and each participant conducted the procedure for estimation of iodine in salt. They calculated the mean, standard deviation and coefficient of variation (which were 26.2 ppm, 1.3 ppm and 5%) for the samples analysed.

The participants then spent time discussing the various lacunae in research in the field of iodine deficiency disorders in the various countries.

Estimation of Iodine in Urine

The participants went back to the theory classroom for a discussion on the **Sandell Kolthoff reaction**, which is the chemical basis for urinary iodine excretion. They also reviewed the various methods available for urinary iodine estimation, as mentioned in the laboratory manual. In the laboratory, the reagents were prepared. Ammonium persulfate, 5N Sulphuric acid, Arsenous acid solution, Ceric ammonium sulfate and Iodine calibrators were freshly prepared with the help of the participants. The samples

brought by **Dr Arun Kumar Aggarwal** from Chandigarh were loaded on to two plates along with the calibrators. The samples were digested and analysed in the microplate reader. The participants then loaded one plate with the iodine calibrators and were familiarized with the use of micropipettes and the precautions to be taken while doing urine iodine estimation. There were many improvisations and improvements that were suggested by the participants.

21st September 2002

The urine samples which were sent for digestion were analysed separately by the participants. The skills that were taught to the participants were the use of the sealing cassette, use of a micropipette, transfer of samples between plates, precautions in use of pipette tips, washing of glassware and reagent bottles.

Country Presentations

The participants from Sri Lanka, Bangladesh and India made presentations about the future course of activities that may be undertaken by them once they returned to their respective countries. **Bangladesh** wanted the network to help them with the proposals for tracking progress and cyclical monitoring. **Sri Lanka** stressed the need for upgrading the laboratory using the microplate method. They also elucidated the areas requiring further research, initially focusing on the North Central Province. An interesting factor was that the Medical Research Institute wanted to initiate a Neonatal Screening Programme in Sri Lanka and since the expertise needed to do so was present outside Sri Lanka, they requested external assistance with a **Short Term Expert Consultation**. In **India**, the **National Institution of Nutrition** in Hyderabad had the infrastructure and was willing to participate in the network. In **Sikkim**, the iodine monitoring laboratory was already functioning and Dr Bimal Rai mentioned that they would need to upgrade the lab to adopt the new simpler microplate method of urinary iodine estimation. The laboratory at **Post Graduate Institute**, Chandigarh was using

the spectrophotometric method and needed resources to upgrade to the microplate method. They were regularly carrying out salt analysis. They also requested external assistance to sort out the barriers. The issues are attached as **Annexure – 2**. The participants were encouraged to approach bilateral and international funding agencies for the carrying out the planned research activities in their respective countries. The Regional Network for South East Asia, which is planned to be established, would assist them in every way.

Feedback

The participants found the workshop relevant and useful. It also served as a platform from which the regional network could be launched. The feedback was that they learnt more about new and emerging technologies and the application of the same to their work. Questions and doubts about the laboratory procedures were answered during the interaction with the leading experts in the field. The participants also appreciated the personal touch given to the conduct of the workshop, ranging from the background material to the personalized laboratory apparel for the participants.

Valedictory Function

In the function, Dr C S Pandav thanked all the participants for their enthusiastic participation, which made the difference between the success and failure of the workshop. Prof M G Karmarkar gave away the mementoes and certificates to all the participants. They then departed for Chandigarh to visit the laboratory of the Post Graduate Institute of Medical Education and Research.

4) Recommendations

- 1) It is affirmed that the **simple microplate method** for urinary iodine estimation is the most cost efficient method among the methods reviewed in the workshop. With an initial resource infusion, the recurring cost and the cost per sample with this method is relatively lesser. It is the recommendation of this workshop that this method be adopted by all the laboratories in a time bound manner.
- 2) Among the indicators used for assessing the IDD status in a population, the laboratory measurements are the only objective values. This makes it vital that the quality of the procedures to make the laboratory measurements is ensured. In this context, there is an urgent need for a regional network of iodine monitoring laboratories. The regional network would be called the **Regional Network for South East Asia (RNSEA)**. The proposal for formation of the network is envisaged as a three step process
 - a. **Step 1** – All the laboratories which are presently using the microplate method standardize their methodology, their processes and begin an external quality assurance program
 - b. **Step 2** – The other labs – Hyderabad, Sikkim, Chandigarh, Nepal, Bhutan, Pakistan, Myanmar and Maldives can be inducted into the Network after they have established the microplate method in their laboratories
 - c. **Step 3** – With a common method and protocol, there can be an exchange of samples whenever any of the participant laboratories undertakes a project on iodine deficiency disorders

The project proposal is enclosed separately.

- 3) The Reference laboratory will initially be located in the ICCIDD Laboratory in New Delhi. It is proposed that there be a cyclical shifting of the reference lab between

the participating laboratories so that all laboratory are familiar with the functions of a Reference Lab. This serves as an excellent capacity building exercise within the framework of a regional Network.

- 4) Some of the laboratories in the region are currently using the spectrophotometric method for estimation of iodine in urine. They are also involved in estimating the iodine content of salt. These laboratories need financial resources to establish the microplate method in their labs. Based on current calculations, it **initially needs USD Fourteen thousand six hundred (\$ 14,600) to establish a micronutrient laboratory** and a **recurring cost of USD Six thousand two hundred and fifty (\$ 6,250)** including manpower, maintenance, glassware and chemicals and the infrastructure costs.
- 5) There is also a need for a published resource base on the quality control process and procedures to be followed by a reference laboratory. This can be in the form of a **Manual on Standard Operational Procedures in an Iodine Monitoring Laboratory**.
- 6) In most of the countries where there is an iodised salt program being implemented, the relationship between the laboratory indicators used to measure the IDD status lose their linear relationship. This presents a mixed picture as is evidenced in case studies in Sri Lanka, India, Thailand and Bangladesh. Thus, there is a need to introduce cyclic monitoring in all these countries.
- 7) The laboratories requiring external assistance may draw out project proposals to address the barriers to establishing a regional network and approach the concerned bilateral agency for support.
- 8) It was proposed to repeat the workshops in the different participating laboratories on an annual basis to improve the capacity of the peripheral laboratories.

Annexure - 1

Inter-Country Training Workshop On
“Iodine Monitoring, Laboratory Procedures &
National Iodine Deficiency Disorders Elimination (IDDE) Programme”
17-21 September, 2002

List of Participants

S.No	Name/Designation	Country / State/Org
1.	Dr. Quazi Salamatullah	ICCIDD National Coordinator Bangladesh
2.	Mr. Nuruddin Chowdhury	Institute of Public Health & Nutrition, Dhaka Bangladesh
3.	Dr. Renuka Jayatissa	Nutrition Department, Medical Research Institute, Colombo, Sri Lanka
4.	Dr. Takshila Amarasena	Medical Research Institute, Colombo, Sri Lanka
5.	Dr. Arun Kumar Aggarwal	Post Graduate Institute of Medical Education and Research, Chandigarh
6.	Dr. S. Ranganathan	National Institute of Nutrition, Hyderabad
7.	Ms. Vandana Sharma	University College of Medical Sciences, New Delhi
8.	Dr. Bimal Rai	Namchi General Hospital, Namchi, Sikkim

Annexure - 2

1) Bangladesh

- a. Bangladesh proposes to implement the cyclic monitoring system for which the proposal is enclosed separately.
- b. As far as the Regional Network for South East Asia is concerned, one laboratory in Bangladesh is already using the simple microplate method of urinary iodine. The cost of the estimation and the extra manpower required would be needed when this laboratory at Dhaka University joined the regional network. It is also proposed that salt iodine estimation be a part of the procedures carried out by the iodine monitoring laboratories. Labs will be involved, regardless of country

2) Sri Lanka

- a. The laboratory at the Medical research Institute would immediately join the Regional Network for South East Asia as they are already using the microplate method of urinary iodine estimation. They would like to address the following issues:
 - i. Common method – the procedures and steps in reagent and standard preparation and the estimation itself should be the same in all the participating labs. There is a need here for a laboratory manual
 - ii. Guidelines for salt and urine iodine estimation with the operational and procedural issues listed out will be required.
 - iii. ISO Certification – there is a potential for ISO certification once the network has a uniform process in place.
 - iv. Support would only be needed for samples exchange.

- b. North Central Province – the North Central Province presents a unique picture with an adequate urinary iodine excretion, high water iodine content and an unexplainably high goitre rate. Detailed collaborative explorative study which needs support is planned to be carried out in this province. There is a need for external assistance in terms of a Short Term Consultancy with an expert who is familiar with the picture that is being presented.
 - i. An Epidemiological study is planned to be carried out with assistance of the Regional Network for South East Asia
 - ii. If they are inconclusive, then animal studies will be carried out with the help of the National Institute of Nutrition in Hyderabad, India.
 - iii. There have been some studies that link endemic iodine deficiency with endemic fluorosis. If the animal studies also do not throw up any light, then a geological study with Dr Susheela from the Fluorosis Research Foundation will be conducted to explore the presence or absence of any link.
- c. Neonatal Screening Programme – Sri Lanka is planning to implement a neonatal Screening programme that will be piloted in a province and later in the whole country. The government would need a Short Term Consultant who is familiar with the following issues:
 - i. Establishment of IRMA / RIA method in the laboratory and standardization of the protocols and processes of the estimation. There must also be an inbuilt external and internal quality control program in the process.
 - ii. Implementing the Neonatal screening as a pilot program in a province and later expanding it to the whole country. This calls for expertise in cost benefit analysis and health economics.
 - iii. The program will not be implemented unless there is a facility for treatment and follow up of the subjects, an inbuilt proviso.

- d. Cyclic monitoring – With the support of UNICEF, a program of cyclic monitoring will be established in Sri Lanka. The Regional Network for South East Asia can assist in the following ways:
 - i. Expert opinion by email on any problems encountered during the implementation
 - ii. Issues related to addressing monitoring in pregnancy and in adolescents
- e. Production site monitoring is can be strengthened by the use of WYD checker to monitor the iodine content in salt.

3) India

- a. Sikkim – The success of the Sikkim program is very well known. There is already an iodine motoring laboratory functioning in Namchi General Hospital. There are plans to upgrade the laboratory to adopt the simple microplate technique for urinary iodine estimation. A cyclic monitoring system is also going to be implemented.
- b. Hyderabad – Intramural activities are already ongoing in the National Institute of Nutrition. The staff and equipment are in place and project wise involvement is possible
- c. Chandigarh – The laboratory at the Post Graduate Institute is doing urinary iodine by the spectrophotometric method. The methos eeds to be upgraded to the simple microplate method. With the present capacity they can analyze 500 samples per morth and would require support with the processing charges. They also plan to form linkages with other institutions in the area and conduct awareness campaigns. Also, due to its unique location they can conduct advocacy at two levels– with the political leadership and also with the community.