

Chapter 34

The Malaysian Experience in a Total Diet Study

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Introduction

Malaysia is one of the Southeast Asian countries that have conducted a total diet study (TDS) on a national basis. Malaysia is aware of the importance of the TDS as an assessment tool that can provide indicators of environmental contamination by toxic chemicals and generates a baseline for food safety and public health measures, including those that relate to nutritional adequacy.

In the past, the safety of the food supply was determined using the conventional approach of monitoring individual foods for compliance with national and international regulatory standards. However, this type of monitoring generally focused on individual chemicals in raw commodities to check compliance with good agricultural practice, and so was of limited value in assessing any potential health risks to the Malaysian population from their total diet, as normally consumed.

An alternative method for ensuring the safety of the national diet is a TDS. It provides a clear assessment of the safety and quality of the food supply. A key characteristic of such a study is that foods are prepared ready for consumption, and this provides the best means of assessing the risk to consumers, in contrast to raw commodity-based surveys. It measures the actual dietary exposure to chemicals by the population, and compares these exposures with health-based guidance values set by the World Health Organization (WHO), such as the Acceptable Daily Intake

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(ADI) and the Provisional Tolerable Weekly Intake (PTWI). These comparisons provide a direct link to the health of the population, and therefore, the TDS is the most reliable way to estimate the dietary exposure of toxicants in population subgroups. Therefore, periodic total diet studies are essential to answer the fundamental question whether the national diet is safe and to assess trends in exposure for the future.

The First Total Diet Study in Malaysia

The Food Safety and Quality Division (FSQD) in the Ministry of Health (MOH) is responsible for conducting the TDS in Malaysia. FSQD realized the importance of TDS through literature research and experiences from other countries that had established TDS programs. The planning to conduct the TDS was initiated in the year 2000 through the forum Research Dialogue, which was chaired by the Director General of Health, MOH. The most important requirements for conducting the TDS were identified as follows:

- (i) Obtaining appropriate food consumption data for Malaysia's population;
- (ii) Developing adequate TDS capability and capacity; and,
- (iii) Implementing a pilot project on TDS.

A TDS will provide estimates of the amount of food contaminants that are consumed by a population or population subgroup. Based on results of these exposure estimates and risk assessments, improved food safety standards and regulations, enforcement protocols and/or procedures, and health education materials can be developed with solid scientific justification. Robust risk assessments will not only benefit implementation of food safety management policies, but will also increase confidence of importing countries that trade with Malaysia.

Food Consumption Data

Food consumption data is one of the essential requirements of a TDS to assess the dietary exposure to contaminants for the population. WHO recommends that, if available, countries should use their own individual food consumption data. Because of this clear need, FSQD, in collaboration with Family Health and Development Division (FHDD), conducted the Food Consumption Survey (FCS) to collect the necessary data. Using a food frequency questionnaire, this survey was carried out from October 2002 until December 2003 throughout Malaysia and consisted of six zones covering all 13 states and the federal territory of Kuala Lumpur. This consumption data was collected on the general population aged between 18 and 59 years old, men and women from various ethnic groups, geographical areas and stratum.

The outcome of the FCS for Malaysia's population was released in 2003 and played an important role in the conduct of Malaysia Total Diet Study (MTDS).

The Food Consumption Statistics (2003) provided individual food consumption data that was used to develop the MTDS food list. The data included 126 foods commonly consumed in Malaysia. The foods were grouped into 12 general categories which are cereals and cereal products, meat and meat products, fish and fish products, eggs and egg products, nuts and nut products, dairy products, vegetables and vegetable products, fruit and fruit products, drinks, alcoholic beverages, seasonings and, sweets and spreads.

Capability and Capacity Building

Training

Capacity building efforts in MTDS were enhanced by ensuring that personnel involved in MTDS are knowledgeable and skilled in this field. Attendance at international workshops, technical meetings, seminars, workshops and consultations, was essential. Some of these activities are presented below.

Japan International Cooperation Agency (JICA) Consultation (2003)

Japan International Cooperation Agency (JICA) consultant, Professor Dr. Hajimu Ishiwata (Department of Human Life and Culture, Faculty of Humanities, Seitoku University, Chiba, Japan) provided the technical expertise in the preparation of the protocol of MTDS for contaminants in 2003. The consultation included advice on planning and conducting of the dietary survey and the MTDS for food contaminants, which continued until the completion of the project.

Study Visit on TDS in Japan (2004)

In September 2004, three officers from FSQD, MOH participated in a 10-day visit to various departments involved in the TDS in Japan. The objectives of the visit were *inter alia* to learn firsthand how to conduct a TDS of contaminants and food additives. During this visit, the officers studied the administration of TDS in Japan, TDS methodology and preparation of TDS composite samples. They also obtained an overview of the Japanese nutrition survey and visited Yokohama Quarantine Station, National Institute of Health Science, Saitama Institute of Public Health and Seitoku Woman University. Following the study visit, FSQD developed its initial Standard Operation Procedures (SOPs) for the MTDS, and a pilot project was carried out in 2005.

FAO/WHO Consultation Program (2006)

In 2006, Dr Philippe Verger (National Institute for Agricultural Research, Paris) and Dr Josef Schlatter (Federal Office of Public Health, Food Safety Division, Nutritional and Toxicological Risks Section, Zürich), two consultants supported respectively by FAO and WHO, conducted training on practical methods of risk assessment of chemical hazards in food. They recommended that Malaysia be involved in the TDS training program conducted by WHO where the objective of the program was to improve the active and effective participation of countries in the elaboration of international standards by the Codex Alimentarius Commission.

WHO TDS Training and Workshop, Beijing (2006)

Malaysia attended the WHO TDS Training Course and Workshop in Beijing in 2006, which exposed the participants to relevant TDS procedures and information. Following this training, the SOPs for MTDS was improved [1].

WHO TDS Training Course, Hong Kong (2008)

Malaysia attended the WHO TDS Training Course in Hong Kong in 2008. The training course equipped the participants with the knowledge and skills required for conducting a TDS, including food consumption data sources, food mapping, sampling, food preparation methods, and types of dietary exposure estimates. Views on the challenges and benefits of conducting TDS were exchanged during a discussion panel, which included participants from Hong Kong, China, New Zealand and Australia [2].

WHO Consultation Program (2009)

In 2009, Dr. Richard Vannoort (Institute for Environmental Science and Research, New Zealand), a WHO consultant, provided technical input and support to FSQD. The consultancy focused on conducting a workshop on exposure and risk assessment of chemicals in the diet, as well as advice on the development of a Malaysian protocol on dietary exposure assessment of key chemicals, including heavy metals and pesticides. This included identifying essential requirements for conducting a TDS, evaluating capacity and capability for conducting a TDS, and developing expertise in terms of knowledge and practical skills in the evaluation of current exposure assessments.

Analytical Capabilities

There are 14 MOH food laboratories located throughout the country, which have been involved in the preparation of composited TDS samples. For the analysis of samples, four Public Health Laboratories were involved, of which one was the TDS reference laboratory.

Instrumentation

An atomic absorption spectrophotometry with a flow injection analysis system (AAS-FIAS) was used for the determination of mercury using the cold vapor technique. Lead and cadmium were determined using the inductive coupled plasma-optical emission spectrometer (ICP-OES). Lead and arsenic were also determined using a graphite furnace atomic absorption spectrophotometry (GFAAS) for low-level determination.

An inductively coupled plasma mass spectrometer (ICPMS) with clean room facility was set up in the TDS reference laboratory to enable more accurate analysis of metals for the TDS. In addition, the ICPMS will significantly reduce the limit of detection as greater sensitivity is important to ensure that exposure assessment calculations use actual data instead of theoretical default values.

Implementation

MTDS was implemented in Malaysia in 2005, where the implementation was divided into three phases, as follows:

Pilot Project (2005)

A small-scale pilot project, involving the central zone and one analytical laboratory, was initiated in 2005. It involved 39 food items based on individual food samples for heavy metal analysis, specifically for mercury, lead and cadmium. The objective of this pilot project was to determine and evaluate the readiness of MOH to carry out the MTDS project. The valuable experience gained during the pilot project was used to further improve the MTDS SOPs.

MTDS Project (2006)

The first MTDS project was conducted from August 2006 until February 2007, based on the food group composites approach, with 11 food groups and 23 sub-groups. The objective focused on mercury, lead, cadmium, and arsenic and implementation followed the MTDS SOPs. This project involved a total of 86 composite samples, involving 13 states and the federal territory of Kuala Lumpur in Malaysia. Analyses were only undertaken by the reference laboratory.

TDS Project (2007/2008)

Prior to this project, the MTDS SOPs were reviewed and minor adjustments were made. A committee was established to oversee the project. The MTDS project 2007/2008 was carried out from November 2007 until December 2008 and involved metal contaminants and pesticide residues using a food composite approach. All states in Malaysia, grouped into six zones, were involved in sample purchasing and sample preparation. A total of 105 food items were purchased and were combined into 57 composite samples for each of the six zones. The four Public Health Laboratories mentioned above analyzed the composite samples.

Having undertaken a pilot and two MTDS projects now, as well as the WHO Consultation Program (2009), Malaysia has strengthened its MTDS implementation capabilities, including its SOPs. To enhance further the MTDS, a master plan for conducting the MTDS is being developed as guidance. A special budget will be allocated and it has been proposed that the MTDS be conducted biennially.

Beginning with the MTDS 2010, food selection for the TDS will be based on the Food Consumption Statistics (2003), and an individual national and regional food approach will be used. Malaysia will utilize this individual food approach and composite individual foods on regional basis for analysis. This approach is more flexible and reliable for subsequent exposure estimates, and also important for traceability purposes. The number of sampling locations is also being reviewed to ensure efficiency of the project. The analytes for analysis will be expanded to include others substances, such as nutrients and dioxins. All samples will be maintained as reserve samples and archived for re-analysis and traceability purposes, if need be.

Conclusion

By carrying out a series of MTDS projects, Malaysia has gained a good deal of knowledge and experience in TDS procedures. Malaysia will continue to strengthen its TDS capacity and capability to ensure the effectiveness of MTDS implementation.

Malaysia now has the benefit of sound scientific risk assessments to protect the public from potentially toxic chemicals in food and in assuring trading partners that the food safety system in Malaysia meets international standards.

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