

ADVANCES IN NUTRITION RESEARCH IN MALAYSIA

TEE E SIONG

*Division of Human Nutrition, Institute for Medical Research,
Kuala Lumpur.*

ABSTRACT: Nutritional research in Malaysia dates back to the beginning of the century, when investigations into the etiology and pathology of beri-beri were actively pursued. Following this pioneering work in the Institute for Medical Research, studies into other vitamin deficiencies and nutritional disorders were carried out, together with several other institutions in the country. Studies into xerophthalmia, rickets, pellagra, angular stomatitis, protein-energy malnutrition, nutritional anaemia and iodine deficiency goitre have been documented for various communities. In the 1980's, nutrition research in Malaysia took on new dimensions. Various other institutions in the country took on greater participation in nutrition research. There has been wider coverage of communities, and nutrition studies took on greater depth and scope. Advances in methodologies in many areas of research are also clearly evident. Furthermore, there is a definite change in the trends in nutrition research, with the change in the pattern of nutritional disease in the country. This paper gives an overview of nutrition research in Malaysia, from the beginning of the century to the first half of this decade. Changes or advances over the years in each area of research are discussed.

1 INTRODUCTION

Documentation of nutrition research in Malaysia dates back to before 1900, when investigations into the etiology and pathology of beri-beri were actively pursued in the Institute for Medical Research. This pioneering work on what was later discovered to be due to a vitamin deficiency in the diet, stimulated a great deal of interest into other vitamin deficiency. In the years that followed, the Institute continued to play an active role in nutrition research. Other institutions also contributed towards the characterisation and understanding of the nutritional problems in the country. Studies were carried out into other vitamin deficiencies, including xerophthalmia, rickets, pellagra, and angular stomatitis, as well as other nutrient deficiencies e.g. protein-energy malnutrition, nutritional anaemia and goitre.

Nutrition research in Malaysia took on new dimensions in the 1980's. Various other institutions in the country took on greater participation in nutrition research. There has been wider coverage of communities, and nutrition studies took on greater depth and scope. Changes in methodologies are also clearly evident. Furthermore, there is a definite change in the trends in nutrition research, with the change in the pattern of nutritional disease in the country as a result of socio-economic developments.

This paper gives an overview of nutrition research in the country, from the beginning of the century to the first half of this decade. For each area of research, advances or changes over the years are discussed. The discussions rely mainly on the bibliographic compilations of nutrition research in the country previously published by this author (Tee, 1980; 1984). It would not be possible nor desirable to cite all reports in this paper due to the limitation of space. Thus only a minimal number of references are cited, and most of these are reviews of specific topics.

2 ASSESSMENT OF NUTRITIONAL STATUS OF COMMUNITIES

Early investigators had already placed emphasis on the assessment of nutritional status of communities. Several nutrition surveys of various communities in Peninsular Malaysia were reported from the 1930's and 50's. This emphasis continued into the two decades that followed. Most of the studies were in the rural areas, and several comprehensive surveys of various communities in Sarawak, including the aborigines were also documented.

In the eighties, researchers continued to monitor the nutritional status of the population through various studies. Communities in Sabah were also studied through several comprehensive surveys. In recent years, several more institutions have also undertaken studies into the nutritional status of communities. Most of these are the recently established local universities. Hence, even though there has been no large scale national nutrition survey, all these studies have contributed towards a better understanding of the nutritional status of the communities. Chong (1984) and Tee and Khor (1986) have recently reviewed the current nutritional status of Malaysians.

An important development in this area is the implementation of the National Nutrition Surveillance System by the Ministry of Health in 1982. Various health and nutritional indicators have been collected to provide a national nutritional profile of the different communities in the country.

Over the years, most community studies had used anthropometric measurements as indicators of nutritional status. Whereas earlier studies had relied solely on weight and height, later studies included mid-arm circumference and skin-fold thickness measurements as well. Another obvious improvement observed is the weight and height reference used. Varying references, usually from western countries, were used in studies prior to 1960. Following that, the Harvard Standard was used by most investigators. In recent years, more investigators are using the NCHS reference recommended by WHO. At the same time, various efforts have been made to derive a reference based on the Malaysian population.

Clinical examination has also been an important part of surveys over the years. This is especially prominent in earlier studies when diagnosis of nutrient deficiencies had to rely on this since biochemical determinations were minimal.

In the early studies, biochemical determinations were seldom a part of the surveys. Even if they were included, these were confined to haemoglobin determination. In later studies, several biochemical determinations were employed by some investigators with the required laboratory backing. The parameters frequently determined were haemoglobin, serum total protein and protein electrophoresis, serum vitamin A and carotene, and urinary urea, creatinine and hydroxyproline determination, as well as stool examination for helminth ova. In recent years, biochemical determinations remain confined to a few laboratories with the necessary facilities.

Food consumption data were also collected in the earlier studies in the country. Adequacy of intake was compared to western references or that from WHO. From the 1960's, a great deal more data on food consumption and pattern have become available. Computed intake have frequently referred to the RDA suggested by S.T. Teoh in 1975. In some recent as well as ongoing investigations, data on food consumption of urban communities are also being collected. Other data documented in relation to this are the numerous reports on food habits, infant and young child feeding practices and the socio-cultural aspects of food and nutrition.

Early studies had already emphasized the multi-factorial nature of the malnutrition problem and thus, most of these examined the socio-economic background of the communities. This aspect continued to be given emphasis in recent studies, in order to understand the ecology of each community.

3 SPECIFIC NUTRIENT DEFICIENCIES

3.1 Vitamin B1 Deficiency

The earliest nutrient deficiency investigated in the country was beri-beri, actively pursued at the beginning of the century. Extensive reports on studies into the etiology and pathology of the disease were already documented by H. Wright in 1902, the first director of the newly established IMR. This work was carried on by the three subsequent directors of the Institute, C.E. Daniels, H. Fraser and A.T. Stanton. Voluminous literature on the subject, documented by these and other investigators in the country were already

available by 1920. The testing of the various hypothesis on the etiology of the disease, how the disorder was connected with rice in the diet, and finally the establishment of the relationship between vitamin B1 and the disease have all been documented in these reports. After this peak period of activities on beri-beri research, reports on the subject declined. By the 1960's, the problem appeared to have been largely overcome, as no further reports on the subject were documented.

3.2 Vitamin A Deficiency

Vitamin A deficiency was actively investigated in the country around the late 1920's, after the commotion created by vitamin B1 deficiency had been somewhat resolved. In the three decades that followed, several other reports on the deficiency were documented. These were all based on clinical observations of communities, and hence only those with manifest keratomalacia were detected. Successful treatment with vitamin A rich foods were also reported. In the 1960's and 70's, biochemical determination of serum vitamin A and carotene began to be carried out in selected laboratories.

The vitamin A deficiency problem continued to be given emphasis in the eighties. In the nutrition surveys discussed earlier in this paper, examination for clinical signs of this vitamin deficiency were often carried out. However, biochemical data on vitamin A status are still relatively scarce since few laboratories are equipped to carry out the determination. More importantly, this is related to the problem of obtaining sufficient blood from children for the determination.

3.3 Nutritional Anaemia

Although the earliest documented study on nutritional anaemia in the country was in the early part of the century, literature on the subject was scarce for two decades. It was only from the thirties that momentum in this area of research picked up. Some of the studies of nutritional status of communities discussed in the previous section had looked into the prevalence of anaemia. Diagnosis was mainly by haemoglobin determination, and sometimes by blood picture examination. The period of most active research in nutritional anaemia is probably the 1950's, when P.W.G. Tasker of the IMR documented numerous studies carried out on various communities, mainly amongst pregnant women.

In the 60's and 70's, anaemia prevalence continued to be given emphasis by various investigators studying the nutritional status of communities. Due to the constraint of laboratory facilities, many of these still relied solely on haemoglobin determination and clinical examination for the diagnosis of the disorder. However, a few laboratories were able to include other biochemical parameters in their studies such as various blood indices, serum iron and transferrin saturation levels. As with the vitamin A determination problem, the small volume of blood available from children usually did not permit these determinations to be carried out during field nutrition surveys.

Nutritional anaemia appear to remain a problem of considerable magnitude in the eighties, as seen from the various surveys carried out recently (Tee, 1985). Following development in diagnosis methodology elsewhere in the world, other biochemical parameters are being employed, including serum ferritin and serum folate levels. However, the general situation regarding biochemical diagnosis of anaemia in most laboratories have not changed much compared to the 70's.

3.4 Endemic Goitre

Studies into iodine deficiency goitre appear to have a relatively late start in the country. Although Vickers and Strahan in 1936 had reported on the incidence of goitre in Kedah, few studies in this area were documented after that. The report of I. Polunin in 1951 on goitre amongst Malays and aborigines was the only other documentation available prior to 1970. This lack of literature on the subject is also because the problem is relatively less prevalent than other nutritional problems discussed above, particularly in Peninsular Malaysia.

Several reports on goitre were documented from the 1970's up to the present time. These were mostly on communities in Sarawak, where the problem is now known to be of a considerable magnitude. The prevalence, etiology and pathology of the problem in this East Malaysian state are highlighted in the recent review of Tan (1982). To obtain recent data on the prevalence and etiology of the problem in Kedah, the IMR has just concluded a study in 7 villages in the state. Whereas biochemical tests were minimal in the early studies, a host of these determinations have been carried out in these recent studies. These include T3, T4 and TSH assays in serum, and iodine and thiocyanate estimations in urine.

3.5 Other Nutrient Deficiencies

Other vitamin deficiencies studied in the early years include pellagra (niacin deficiency), a condition termed as "burning feet", vitamin B2 deficiency, and scurvy (vitamin C deficiency). These deficiencies did not appear to be important nutritional problems in the 60's and 70's, as well as in the 80's, as there were no further reports on these disorders.

4 DIET AND CORONARY HEART DISEASE

Studies into overnutrition and associated disorders are relatively recent undertakings in the country. No reports in this area were documented prior to 1960. World-wide interest in the relationship between diet and coronary heart disease also generated some research activities in the country from the 60's. Several studies on serum lipid levels of Malaysians by Y. H. Chong and co-workers of the IMR and other researchers showed that this was also a problem amongst the more affluent segments of the population. Comparative studies of Orang Asli in the deep jungle and those in the periurban and jungle-fringe have revealed low levels of serum lipids and absence of coronary heart disease in the former group, while the latter tend to have higher serum cholesterol and blood pressure values. Studies in the area have continued up to the present time. A great deal of improvements in the methodology for the determination of serum lipids have been introduced over the years. To cope with the increasing demand for these analysis, an automated method have also been established in the IMR since 1976. In recent years, the introduction of high density lipoprotein cholesterol determination has improved the assessment of CHD risk. Recent publications of Chong and Ng (1985) and Chong (1986) report on current understanding of the problem. An IMR study of CHD risk factors amongst executives in the city, expected to conclude this year, should provide further understanding of the problem amongst Malaysians.

5 STUDIES ON FOOD COMPOSITION

5.1 Nutrient Composition of Local Foods

Interest in the nutrient content of local foods was already evident in the early part of the century, as indicated by the report of A.T. Stanton in 1923. Most of the work on the subject, however, were carried out in the 1930's and 40's. A number of reports on the analysis of selected food items and nutrients, particularly selected vitamins and minerals were reported. A few food composition tables were also published. From the 50's, reports on the subject were relatively fewer in number. Nevertheless, work carried on, and most of the data were generated from the IMR laboratory. A more detailed review of the nutrient analysis of food during the pre-eighties period have been given by Tee (1981a).

Over the years, major advances have been made to the techniques for nutrient analysis. For instance, in the analysis of vitamins, perhaps the most fascinating group of nutrients studied, dramatic changes have been made. For most vitamins, earlier work had employed biological assay procedures. Generally, by the late 1930's, these were replaced by colorimetric, titration and fluorometric procedures. Aside from reducing the analysis time,

these were also more precise and reproducible. With regards to mineral analysis, there were less dramatic changes. Nevertheless, generally, methods had changed from the earlier gravimetric to the less tedious volumetric and colorimetric methods. In the analysis of proximate composition of foods, procedures remained essentially the same over the years. Details of these advancements in nutrient analysis techniques have been described in Tee (1981b). Another notable development in this field of research prior to the eighties is the analysis of fatty acid composition and cholesterol content of foods by the IMR in the 70's. These studies were carried out at the time when the Institute was very much interested in the role of dietary fats in coronary heart disease discussed above. The laboratories at PORIM in Bangi are now probably the best equipped in the country for lipid analysis.

In recent years, there has been even greater emphasis on nutrient analysis of foods, leading to increased activities in this field. More institutions in the country are playing a more active role in the generation of food composition data. The range of nutrients analysed have expanded. For example, amino acid composition of foods have been given prominence, and for the first time, work on the analysis of folate content of local foods were carried out. Whereas earlier studies had concentrated on raw foodstuffs, current analysis programme also includes the analysis of cooked foods, whose composition data is in increasing demand. There has also been greater emphasis on quality of food composition data.

An important development in this area is the initiation of a programme by the IMR in the eighties to compile and update food composition data for use in the country. As a result, nutrient analysis of foods has taken on a more systematic approach. Hence, whereas most earlier studies had analysed only a limited number of nutrients, current activities are aimed at producing complete nutrient data for the food table. An important consequence in this regard is that the analysis programme is a collaborative effort between the IMR, the Food Technology Division of MARDI, the Faculty of Food Science and Technology of UPM, and the Department of Food Science and Nutrition of UKM. Based on a preliminary food table published in 1982, systematic analysis of foods has been carried out and an update to the table has been published.

Further improvement to the methods of nutrient analysis have been made in recent years. Although for most nutrients the techniques have remained essentially the same as those in the 70's, refinement to methodology, especially with regards to vitamin analysis are evident. In addition, there is more usage of instrumentation and semi-automation in the procedures. Some laboratories have also been able to make use of the much talked about HPLC, although data from the use of such instrument are still scarce. A discussion of the currently used methods for nutrient analysis of foods has been given by Tee (1986).

5.2 Toxicants in Foods

Studies into toxicants in foods is a relatively new area of research in the country. With the outbreak of Turkey 'X' disease in England in 1960, and the subsequent discovery of aflatoxin as the causative agent, investigators in the country also turned their attention towards this toxicant. Several reports on the chemical identification and analysis of aflatoxin in local foods were documented by Y.H. Chong and co-workers and G.F.J. Moir in the 60's. Reports on aflatoxin contamination of foods were few and far in between after that. However, in recent years, there appears to be renewed interest in the subject (Mat Isa and Tee, 1984; Tee and Siti M. Shahid, 1984), and research is expected to pick up again in the near future.

Another group of food toxicant that has received attention from investigators in recent years is lead. Several reports have been documented and a study of this contaminant in a variety of foods was recently concluded by the IMR.

Increasing consumer awareness on food safety has prompted various other studies into food contaminants in recent years. These include reports on various anti-nutritive factors

in foods (particularly legumes), other heavy metals such as mercury, and food additives, including colouring matters and nitrates and nitrites. In this regard, there has also been increasing interest on the association between diet and cancer development.

6 NUTRITION RESEARCH IN THE NEAR FUTURE

An important development that has not been mentioned above is the increasing use of computers in nutrition research. Even institutions without computer personnel to write programmes for specific uses find electronic data processing extremely useful as many of the general soft-ware packages available can be adapted for use. Aside from the obvious advantage of using computers in various statistical analysis and word-processing, specific uses in nutrition research are for instance in the computation of nutrient intake from food consumption studies, the storage of food composition data, and the analysis of anthropometric data. The use of computers in nutrition research is expected to rapidly increase and improve in the next few years.

With regards to the various areas of nutrition research, the general trend of study is expected to be much of the same as the first part of this decade. There may however be a slightly different emphasis on some areas.

The assessment of the nutritional status of communities will continue to be of concern to nutritionists in the country. The government is continuing with its socio-economic development programmes, and there is a great deal of emphasis on poverty eradication under the Fifth Malaysia Plan. There is therefore a need to continue to monitor the nutritional status and update our knowledge on the nutritional problems of the communities. The emphasis will continue to be given to rural agriculture communities, including those in Sabah and Sarawak. Nevertheless, as seen from some of the studies planned for the next few years, there is a definite move towards studying the underprivileged urban households as well.

Growth retardation resulting from protein-energy malnutrition will continue to be a problem of considerable magnitude, particularly amongst children. Anaemia, and another persistent problem, vitamin A deficiency, will continue to receive a great deal of attention. Goitre, particularly in Sarawak, will continue to be given emphasis. There is a need to monitor national food consumption on a regular basis. In all these areas, there is expected to be improved diagnostic procedures, particularly with regards to biochemical analysis. In the other extreme, the problems associated with overnutrition will also be studied. More data on obesity, hypertension and coronary heart disease are expected to become available.

Activities in nutrient analysis of foods are expected to continue, and the next up-date of the food table should see a more complete compilation. Methodologies in this area will continue to undergo refinement and improvement, in line with the goal of obtaining quality food composition data. Non-nutrient components of foods, including food toxicants, will be given greater attention in the coming years, since there is still a great deal of gaps in our knowledge in this area.

Finally, the author would like to take this opportunity to call for more communication and greater collaboration between researchers of the various institutions in the years to come. Particularly during the current economic recession, optimising usage of resources and sharing of experiences should be emphasized.

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