Resistant to the insulin-mediated glucose uptake in liver, adipose tissue and muscle is the central feature of insulin resistance syndrome (IRS), recently also termed as metabolic syndrome. The pancreas secretes excessive insulin, thereby, causing hyperinsulinemia, which finally leads to hyperglycemia. The excessive flux of non-esterified free fatty acids from the excess adipose tissues and hepatic overproduction of very-low-density lipoprotein cholesterol are key metabolic events resulting in dyslipidemia.

The clinical definition of metabolic syndrome has been derived from data provided by Caucasian and Indian populations. Several features of metabolic syndrome are applicable to Indians. The prevalence of obesity was much lower as compared to Caucasians, despite similar fasting plasma glucose levels. Similar data have been reported from other parts of the USA.

Insulin Resistance in Indians
A. Misra*, J.S. Wasir**, N.K. Vikram***

Type 2 diabetes mellitus (T2DM) and coronary heart disease (CHD) are important non-communicable diseases (NCDs) in developed as well as developing countries. Migrant South Asians have an unusually high predisposition to develop both the NCDs. Rapid nutritional transition and urbanization have resulted in an alarming increase in NCDs in India, while the communicable diseases are showing a downward trend. During the previous three decades, the prevalence of T2DM has doubled in both rural and urban areas of India.

**Insulin Resistance**

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**Indians residing in India:** Diet and physical activity profiles of Indians residing in India are extremely heterogeneous. People in the rural areas are physically active farmers or labourers and consume frugal diets. However, increasing affluence, mechanization and dietary transition to 'energy-dense' diets is seen in a stepwise manner from smaller cities to metropolitan mega cities. The prevalence rates of obesity and T2DM in the rural populations are low, but these rates show an increasing trend from smaller to larger cities, peaking in the metropolitan cities. Nearly 10-20% of urban people have metabolic syndrome. A more worrisome feature is highly prevalent insulin resistance in children and young adults who seem to be undergoing "lifestyle transitions" more rapidly (Figure 11). People belonging to low socioeconomic strata (SES) are generally leaner and have less T2DM than those with high SES. However, rural-to-urban migrants who belong to low SES are adversely affected and show several features of metabolic syndrome and multiple cardiovascular risk factors.
BODY FAT DISTRIBUTION

As compared to Caucasians in the developed countries, the prevalence of obesity is less in Indians. An increasing trend in obesity in Indian children and adolescents, however, has been recently reported.

The paradox of high predisposition to developing T2DM and CHD at a relatively lower average level of body mass index (BMI) is not easily explained; however, several peculiar features in the body composition of Indians have been noticed. It appears that migrant and urban Indians of both sexes have excess of body fat, truncal subcutaneous fat, and intraabdominal fat. Data showing a higher prevalence of abdominal adiposity, as defined by high ratio of waist-to-hip circumference, have been consistently recorded in migrant Indians irrespective of their geographical habitat. It is generally believed by many investigators that excess regional adiposity as seen in Indians is the key determinant to the development of insulin resistance.

Subclinical inflammation: Subclinical inflammation denoted by high C-reactive protein (CRP) concentrations, an important indicator of cardiovascular risk, has been recorded to be widely present in Indians, adults as well as children. Importantly, the CRP levels in Indians are consistently higher than in Caucasians. The high CRP levels could be explained by excess abdominal adiposity, since the predominant source of these cytokines is abdominal adipose tissue. Indeed, high CRP levels in Indians were strongly associated with obesity, abdominal obesity, and excess subcutaneous body fat.

Whereas the relationship between insulin resistance and subclinical inflammation continues to be debated, CRP levels in Indians also correlate to insulin resistance. Finally, although CRP levels have predicted an increased risk of developing of CHD prospective data are needed.

LIFESTYLE AND GENETIC FACTORS

Diet: The link between Indian diets and insulin resistance has been suspected but remains inadequately investigated. In general, consumption of saturated fat has increased in India in line with ‘dietary Westernization’, and this might be linked to overall as well as abdominal adiposity. The high carbohydrate content of Indian diets may cause hypertriglyceridemia and hyperinsulinemia. The vegetarian dietary habits of Indians may not be protective against adiposity and dyslipidemia. Additionally, fibre intake may be lower and homocysteine levels may be high in vegetarian Indians, contributing further to cardiovascular risk. Dietary acculturation of migrant Indians to the ‘Westernized diets’ may lead to further unfavourable metabolic changes.

Physical inactivity: Physically inactive lifestyles are consistently seen in South Asians, particularly in women. The important determinants include urbanization, affluence and increasing mechanization. Recent reports also indicate substantial physical inactivity in adolescents and young adults. Physical inactivity in Indians has been linked to adiposity, dyslipidemia, and hypertension. Although only a limited number of investigative studies are available, it appears that physical inactivity is a critical determinant of obesity and insulin resistance in Indians.

Genetic predisposition: The fact that Indians in disparate countries and locations uniformly show a higher tendency to have insulin resistance bespeaks of underlying genetic predispositions. Further, insulin sensitivity is reduced even when the role of adiposity is nullified in lean Indians as compared with other ethnic groups. However, this issue has not been investigated in any detail. The role of candidate genes lipoprotein lipase, plasminogen activator inhibitor-1, adiponectin, angiotensinogen and peroxisome proliferator receptor-gamma remain to be investigated in insulin resistant Indians.

Authors: *Professor **Pool Officer ***Asst Prof. Dept of Medicine, AIIMS, New Delhi

References:


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**FOUNDAUTION NEWS**

- Meeting on Food and Nutrition Security in South Asia: (March 7 – 9, 2005)

The Nutrition Foundation of India, with the cooperation of the Government of India and the United States Department of Agriculture, organized a three-day meeting on Food and Nutrition Security in South Asia.

Dr C. Rangarajan, Chairman, Economic Advisory Council to the Prime Minister, Government of India, delivered the inaugural address. An excerpt from the address appears elsewhere in this Bulletin.

Delegates from seven countries of South Asia, namely, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, participated in the meeting.

In the first session, delegates described the experiences of their respective countries in promoting nutrition security through appropriate nutrition orientation to food production policies.

The second session dealt with policies and strategies to accelerate poverty reduction.

The third session was devoted to discussions on ongoing programmes for improving access to food. The delegates presented their experiences in ensuring targeting and good coverage under these programmes, and evaluated the impact of the programmes on the prevalence of undernutrition.

In the fourth session, the health consequences of under/overnutrition and country programmes for combating these problems were discussed.

The rapporteurs presented summaries of the presentations in each session, and presented similarities and contrasts between the countries. They also summarized the recommendations regarding policies, strategies and programmes for improving nutrition security and the nutritional status of the populations of South Asian nations.

The report of the meeting is being edited by Ms Malini Sheshadri.

The delegates to the meeting were:

**Bangladesh:** Mr M.A. Hussain; Dr M. Hossain; Dr H.H. Akhter; Dr F. Naheer

**Bhutan:** Ms C.P. Wangdi; Dr D. Kinlay

**India:** Dr B.N. Yogundhar; Dr A. Sen; Dr V. Prakash; Dr P. Ramachandran

**Maldives:** Ms Shazla Mohamed; Dr M. Shareef; Dr A.S. Mohamed

**Nepal:** Dr S. Acharya; Mr A. Talukder; Prof B. Pyakural; Dr D. Paudyal

**Pakistan:** Dr Naeeem I. Hashmi; Mr M.A. Khan; Prof F.M. Anjum

**Sri Lanka:** Dr P. Soysa; Dr S. Weerasesa; Dr R.M.K. Ratnayake; Dr C. Piyasena

**Resource Persons:** Mr Chad R. Russel; Mr. David Kincaid; Dr C. Bantilan; Dr M. Ali; Dr S. Babu; Dr C. Kapoor

**Rappoteurs:** Mr M. Banmi; Dr K. Krishnaswamy; Dr N. Singh; Dr A.N. Kapoor
Excerpts from the Inaugural Address by Dr C Rangarajan

Food security in India has essentially meant food grain security for meeting the requirements of energy and protein. For nutrition security, food production should ensure availability of diverse foods, which can enhance the nutritional content, including micronutrients. Nutrition security is thus a broader term. It includes within it food grain security but goes beyond it.

Undernourishment has a deleterious effect on the life of people. Malnourished children grow up to become adults unable to operate at full potential. Development economists and policy makers need to take into account the effects of nutritional and health care deprivation on human productivity. The links between nutritional status and the capacity for work have so far been adequately incorporated in growth models. Poor nutrition and under nourishment result in low productivity leading to low wages which, in turn, results in poor nutrition intake. Thus a vicious cycle is set in motion. One writer has described this as the 'poverty trap'.

Ensuring nutrition security requires attention to programmes aimed at-

(a) Enhancing food grain production with a nutritional orientation;
(b) Improving the food distribution system so that the poor have access to food grain at affordable costs;
(c) Augmenting the purchasing power of the poor through special schemes in times of stress and vulnerability; and
(d) Focusing on direct nutrition intervention programmes to address the needs of vulnerable groups.

Countries of South Asia have a common heritage. They were all under colonial rule till the middle of the last century. Newly independent, they face similar problems. Ensuring food and nutrition security is one such problem. All the countries in this region have addressed this problem in similar ways. We need to know which programmes have been successful and which have not. This meeting will enable you to make an assessment.

All programmes aimed at ensuring food and nutrition security involve heavy expenditure by Governments. The conventional budget exercises focus on allocation of resources to different heads without assessing how these expenditures get translated into outputs and outcomes. Outputs are the direct result of government expenditure and outcomes are the final results. For example, in the context of education, opening a new school or appointing a new teacher is an output and raising literacy ratio is the outcome.

The emphasis must, therefore, be on output and outcome rather than allocation. Public expenditures must be guided by the criterion of economy, efficiency and effectiveness.

These are particularly important in the case of programmes aimed at improving the nutrition status of the population, since the expenditures are large and goals are specific.


dot Study Circle Meetings

January 18th, 2005.
Dr Siddharth Ramji (Professor & Head, Department of Neonatology, MAMC, New Delhi) delivered a talk on "Neonatal Feeding: Long Term Health Outcomes".

February 16th, 2005
Dr Anoop Misra, (Professor, Department of Medicine, AIIMS, New Delhi) spoke on Metabolic syndrome in Indians: Trials and Tribulations.

NATIONAL ACADEMY OF MEDICAL SCIENCES (NAMS)

Dr Pramatha Mitra, Director NFI has been elected as the Vice-President of NAMS. She will hold the office for two years.

Mid-day Meal Programme in Delhi Schools

NFI has been collaborating with the Municipal Corporation of Delhi (MCD) in the implementation of the Mid Day Meal programme in Delhi schools. A meeting to discuss future collaborations with MCD was held on January 31st, 2005. The meeting was attended by Mr Rakesh Mehta, Commissioner, MCD, officials of MCD associated with the NFI-MCD collaborative projects, and the NFI team.

NUTRITION NEWS

Course in Practical Paediatric Nutrition

Dr Sarath Gopalan and Dr Anupam Sibal, the Course Directors conducted the Fifth Course in Practical Paediatric Nutrition on March 5th and 6th 2005 at Indraprastha Apollo Hospital, New Delhi.

Nutrition in the Philippines: The Past for its Template, Red for its Color

Recently the Philippines Press launched a book "Nutrition in the Philippines: The Past for its Template, Red for its Color", authored by Dr Cecilia A Florencio. The book describes and analyses the advances and shortfalls in the country's thinking and efforts to address the long-standing, widespread, and layered problem of malnutrition in infants, children, adolescents, pregnant and lactating women, adults, and the elderly. The author puts forward recommendations for reflection and action, on specific and broad fronts, and while recognizing the reality of an increasingly borderless world; she calls for the country to address its nutritional situation with the national interest and priorities first. And yet, in a general sense, the book is as much about many other countries in both the East and West as it is about the Philippines. In the global community, it is estimated that 800 million people are food insecure and 170 million young children suffer from undernourishment. Copies of the book can be ordered from press@up.edu.ph or uppress@uppress.org (website: www.uppress.org).