GOPALAN MEMORIAL ORATION FOLDER

45th GOPALAN MEMORIAL ORATION
ON

THE DIABETES EPIDEMIC IN INDIA: SOME LESSONS LEARNT

By

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THE AWARD

The Gopalan Oration Award was instituted in the year 1974 by the Nutrition Society of India in honour of its Founder-President, Dr. C. Gopalan, who has been the guiding force behind the Society since its inception. In his capacity as the Founder-President and as a permanent Executive Committee Member, Dr. Gopalan has nurtured the Society and has built it up to its present stature. The Society, as it is today, bears testimony to his genius as an architect and father of nutrition sciences in India.

Dr. Gopalan was the founder President of Nutrition Foundation of India. He was a scientist of international eminence and has spearheaded the cause of nutrition science for over four decades. His contribution towards the betterment of nutrition of population has benefited not only India but other developing countries as well. It has helped to strengthen and inspire movements for the eradication of under-nutrition among the underprivileged in many Third World countries.

Dr. Gopalan had a brilliant academic career at the Madras Medical College and obtained a Doctoral degree in Medicine. During his illustrious career, Dr. Gopalan has held several prestigious positions with distinction that has brought fame not only to him but to his country as well. He was the first Asian to be elected the President of the International Union of Nutrition Sciences and the first Chairman of the Regional Advisory Committee on Medical Research for South-East Asia of WHO. He was on several World Health Organisation Expert Panels for many years and was the Chairman of the Technical Session of the World Health Assembly. He was elected Fellow of the Royal Society of London. He was also the first Nuffield Foundation Fellow from India in Medical Research Council of United Kingdom and a Rockefeller Foundation Fellow.

The National Institute of Nutrition (NIN), Hyderabad, India, was nurtured by Dr. Gopalan with rare dedication as its Director from 1960 to 1974. Dr. Gopalan was also responsible for forging a fraternity of Asian nutrition scientists and initiating the first Asian Congress of Nutrition and promoting the subsequent ones, which led to the formation of the Federation of Asian Nutrition Societies. He is an able administrator and a visionary. During his tenure, as the Director of NIN and later as the Director-General of ICMR, the country as a whole focussed its attention on nutritional and medical problems of public health importance. Under his leadership a wealth of information was generated to tackle problems such as Protein Energy Malnutrition, Vitamin A deficiency, Phrynoderma, Lathyrism, Fluorosis and Pellagra. The foundation of the National Nutrition Monitoring Bureau was laid by him. Dr. Gopalan has also created the Nutrition Foundation of India, which has a wide interdisciplinary research network in the country and has brought out valuable reports which are of great value to nutrition scientists, administrators and policy makers. Some of the renowned national and international honours bestowed on him for his outstanding contributions include Dr. B.C. Roy National Award (1974), Dhanvanthri Award (1978), WHO Health for All Medal (1988), Sir C.V. Raman Gold Medal of the Indian National Science Academy (1988), International Union of Nutrition Sciences Award (1989), R.D. Birla Award (1990) and Fellow of the International Union of Nutrition Sciences (1993) and ICMR – NIN centenary award (2018). He was also conferred the prestigious civilian awards Padma Shri in 1970 & Padma Bhushan in 2003 by the Government of India.

Living Legend Awards from International Union of Nutritional Sciences -IUMS (2003) and Federation of Asian Nutiriton Societies – FANS (2019).

Dr.Gopalan passed away after a 100 fruitful years of life on 3rd October, 2019.

The Gopalan Oration Award is given every year to an expert who has made significant contributions in the field of nutrition and allied sciences.

The Nutrition Society of India is proud to announce that the 45th Gopalan Oration will be delivered **Dr.V.Mohan,** Chairman & Chief of Diabetology, Dr.Mohan's Diabetes Specialities Centre & Madras Diabetes Research Foundation, Chennai, India on "THE DIABETES EPIDEMIC IN INDIA: SOME LESSONS LEARNT".

THE RECIPIENT

Dr. V. Mohan is the Chairman and Chief of Diabetology at Dr. Mohan's Diabetes Specialities Centre at Chennai in South India which is an IDF Centre of Excellence in Diabetes Care. Dr. Mohan oversees a chain of 50 diabetes centres across 8 states of India and has over 540,000 registered diabetes patients in his centres. He is also President and Director of the Madras Diabetes Research Foundation which is Asia's largest stand-alone diabetes research centre. His Main research interests are Epidemiology of diabetes and its complications, Genomics of diabetes including Monogenic Diabetes & type 1 diabetes, Fibro-calculous Pancreatic Diabetes and Precision Diabetes.

Deeply interested in research from his undergraduate medical student days, Dr. Mohan has published 1465 papers in peer reviewed journals. This includes 939 original articles, 347 review articles and invited editorials and 179 chapters to text-books on Diabetes. His research has attracted over 152,000 citations and has a 'h index' of 138. Dr. Mohan was ranked among Top 2% of Scientists in the World and highest ranked Scientist in Tamilnadu by Stanford University and among top 0.1% of researchers in type 2 Diabetes by Expertscape (Pubmed).

Dr. Mohan has trained a large number of physicians & diabetologists in addition to Nurses, Educators and received over 200 awards including the prestigious Dr. B.C. Roy National Award by the Medical Council of India and the Dr. B. R. Ambedkar Centenary Award, the highest award for Biomedical research given by the ICMR. He was conferred the Dr. Harold Rifkin Distinguished International Service in the Cause of Diabetes Award by the American Diabetes Association and he is the first Indian to receive this award. Recently he has been conferred FRS from the Royal Society of Edinburgh.

For his extensive contribution in the field of diabetes, in 2012 Dr. Mohan was awarded Padma Shri by the Govt. of India.

Dr.Mohan's autobiography 'Making Excellence a Habit: The Secret to Building a World-Class Healthcare System in India', was published by Penguin India is a best seller.

THE ABSTRACT

Diabetes is now spreading rapidly to low and middle income countries like India (1). According to the International Diabetes Federation (IDF), Diabetes Atlas, Tenth Edition (2021), India had 74.1 million people with diabetes in the year 2021 and this is expected to increase to 124.8 million by the year 2045 (2). The **I**ndian **C**ouncil of **M**edical **R**esearch, **In**dia **Diab**etes (ICMR–INDIAB) study, the largest epidemiological study on the prevalence of diabetes, published in *Lancet Diabetes & Endocrinology* showed wide variation in prevalence of diabetes within India (3). The prevalence of diabetes in urban India is twice that of rural India. In most states, the rate of pre-diabetes exceeded the rate of diabetes, a forewarning that the epidemic is far from over. Thus, effective preventive programmes need to be urgently implemented to tackle the diabetes epidemic in our country.

Why the epidemic of diabetes in India ?

Although genetic factors undoubtedly play a major role in the predisposition of diabetes in Indians, environmental factors contributes to over 50% of the risk and indeed the epidemic is driven by environmental factors as our genes did not change in 40 years.

The Chennai Rural Urban Epidemiological Study (CURES) revealed that refined grain intake was positively associated with the risk of T2D (OR 5.31 (95 % CI 2.98, 9.45); $p < 0.001$), specifically dietary carbohydrates (predominantly contributed by polished white rice) showed an increased risk for T2D as did the glycemic index and glycemic load of foods. However, dairy products were found to be protective against type 2 diabetes (4). Consumption of fruits and vegetables conferred 48% protection against CVD risk factors including T2D (5) However, the impact of the quality and quantity of dietary fats cannot be overlooked. In CURES, we reported that the MUFA was negatively associated with the risk of T2D (6). Appropriate use of cooking oils, cooking methods and encouraging the inclusion of nuts and oilseeds, thus emerged as effective dietary strategies to reduce risk of T2D. We also showed that consumption of 30g cashew nuts decreased systolic blood pressure and increased HDL cholesterol concentrations in T2D without undesirable effects on body weight, glycemia, or other lipid variables (7). We next developed *a Food-Based Indian Diet Quality Score (IDQS)* where the food groups were scored and showed that diets with the highest IDQS, had the lowest risk of T2D.

Cross sectional studies have their own limitations as it is difficult to establish a cause / effect relationship. We assessed the association of white rice intake with *incident* diabetes in the Prospective Urban Rural Epidemiology (PURE) study. This study was carried out on 132,373 individuals for 21 countries in 5 continents. The study showed that in S. Asia where white rice intake was high, there was a strong association with *incident* type 2 diabetes (8).

Thus, the link between excess white rice intake with T2DM has been established. We also showed for the first time, in the PURE study that high glycemic index was also linked to excess mortality (9).

We next studied whether replacing white rice with brown rice could improve 24 hour blood glucose and insulin levels (10). However, our studies (11,12) revealed that due to the colour and texture of the cooked brown rice, it had low acceptability in society, although admittedly it had a much lower glycemic index than conventional white rice (13).

Since the prevalence of prediabetes is very high, there is a 'golden window of opportunity' to prevent T2D. The big question is how do we take diabetes prevention to the masses. It is worth showing the Asiad Colony success story. We had carried out the Chennai Urban Population study (CUPS), in two urban residential colonies one representing the middle income group (Asiad colony in Tirumangalam) and the other representing the low income group (Bharathi Nagar in T.Nagar) in Chennai city, in southern India. The study, conducted from 1996 to 1998 showed a significantly higher prevalence of diabetes in the middle-income group (12.4%) compared to the lower income group (6.5%) (14). The results of the study were discussed with the residents of both colonies. After these awareness campaigns, the middle-income residents realized the value of physical activity and built a beautiful park adjacent to their colony, by raising funds through their own resources thus increasing their physical activity A follow up study was done after 10 years which showed that in the middle-income group, the prevalence of diabetes increased from 12.4 to 15.4% (24% increase), while in the lower income group, it increased from 6.5 to 15.3% (135% increase) (15). This study is the first of its kind in India to introduce a "real-world" lifestyle intervention in prevention of diabetes through community empowerment.

Recently, we carried out a unique ten-year longitudinal follow-up of the Chennai Urban Rural Epidemiology Study (CURES). Our results show that more than 80% of cases of diabetes can be prevented in this Asian Indian population just by modifying five risk factors (16). Modifying diet and physical activity alone, could reduce over half (52%) of new onset diabetes (17).

Based on these findings, we conducted a large randomized control trial on prevention called the 'Diabetes Community Lifestyle Improvement Program (DCLIP)' in people with prediabetes. We found that there was the reduction of incidence of diabetes by 32% in those with impaired glucose tolerance by lifestyle modification (18).

The next huge challenge is how to provide specialized diabetes care to rural India as 72% of Indians live in rural areas whereas 80% of doctors practice in urban areas. Most people in rural areas are extremely poor and cannot afford any treatment. Hence, we developed the "Chunampet Rural Diabetes Prevention Project (CRDPP)" with a mobile van and with the use of telemedicine. 27,014 individuals (86.5% of the adult population) were screened in 42

villages of Kancheepuram District in Tamil Nadu in south India. As a result of the follow up treatment given, the mean glycated haemoglobin levels among the diabetic subjects in the community decreased from 9.3 ± 2.6% to 8.5±2.4% within a year (19). We also found that less than 5% of patients needed referral for further management to the tertiary diabetes hospital in Chennai. Thus, the CRDPP can be used as a model for diabetes prevention and health care delivery in undeserved rural areas of developing countries like India (20). In summary, it is clear that to tackle the menace of the diabetes epidemic, multiple stakeholders have to work together and we have to find local solutions. The time to act is **NOW!**

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