Ethno Med., 2(1): 51-56 (2008)
PRINT: ISSN 0972-0073 ONLINE: 2456-6802
DOI: 10.31901/24566772.2008/02.01.06

# Some Salient Points in Dietary and Life- Style Survey of Rural Bengal Particularly Tribal Populace in Relation to Rural Diabetes Prevalence

**Analava Mitra**

*Faculty, School of Medical Science and Technology, B.C. Roy Tech Hospital and Indian Institute of Technology, Kharagpur 721 302, West Bengal, India*
*Telephone: 03222-282657; Fax: 03222-282631; E-mail: amitra@adm.iitkgp.ernet.in*

**KEYWORDS** Type 2 diabetes; diet; tribes; herbal principles

**ABSTRACT** In rural Bengal incidence of diabetes is on the rise. Both diet and life-style factors are blamed for it. It was observed that rural diet is diabetogenic. Prevalence of diabetes varies in different areas depending on dietary, socio-cultural and other factors. While in non-tribal areas food and life style factor maintains homogeneity, in tribal areas it is not. In Bengal main tribes are Asur, Birhor, Korwa, Lepcha, Munda and Santhal etc. Their dietary and life style factors need to be extensively studied to draw a reasonable conclusion.

## INTRODUCTION

### Incidence of Diabetes in India

Incidence of type 2 diabetes in India is on the rise and literally it can be said that India is facing a diabetic explosion. The exact causes of the same are unknown. The curious points in diabetes sufferers of India are incidence of diabetes happens to occur at an early age and mostly males are affected (Mitra et al., 2007). In Indian villages, from a sample survey of 12,000 people about 2 % have diabetes (Vaatsalya Team, 2006). On the basis the ICMR estimates the prevalence of diabetes in adults to be 3·8% in rural areas and 11·8% in urban areas (Mitra and Bhattacharya, 2006). From a sample study of Medavakkam town near Chennai, which was a village a decade ago, that the prevalence of diabetes rose from 2.4 per cent to 5 per cent within five years of urbanization (Special Correspondent, 2004). Migrant Asian Indians living in different parts of the world had shown a higher prevalence of diabetes than other ethnic groups living in the same countries (Ramachandran et al., 1990). Evidence showing that Indian migrants have a high tendency to develop diabetes led to several national epidemiological studies in India. Availability of uniform criteria for diagnosis and classification of diabetes made comparison between the studies possible (WHO, 1985). These surveys showed that diabetes was as common in urban India, as among migrant Indians (Ramaiya et al., 1990). The Chennai Urban Rural Epidemiology Study (CURES), which sampled 26,001 persons, recorded a prevalence of 16 % (Mohan et al., 2005). All the surveys done indicated increasing incidence of diabetes in rural sectors. As India lacks health infrastructure particularly in rural sectors (Park, 2000) this study was done to observe some of the salient points of rural diabetic populations in South Bengal (West Midnapur District).

### Economic Impact of the Disease

The cost of treatment of this disease per se and its accompanying complications can ruin families. The median annual direct medical cost for patient with Type-2 DM without complications was Rs. 14,507/- (Bhaskaran et al., 2003).

### Relationship with Religion

It was observed by analyzing the data of 7600 volunteers (obtained from different hospitals and health centers of West Midnapur District) of which 1560 was Muslim, 5200 being Hindu and the rest Christian, the prevalence of diabetes was less in Muslim and the ratio in Hindu, Muslim and Christian being 11:8: 13. Of the Muslims who do regular prayer five times a day the ratio is much less. The ratio in non-prayers, those who prays once a day, twice a day, thrice a day and five times a day are 9: 7: 5.5: 3: 2 respectively. The exact cause being unknown. The particular

posture of Muslim worship may have some role. It was found that by us that while estimating serum insulin values (radio-immunoassay) of several volunteers maintaining identical conditions repeated stooping exercises can increase serum insulin values by 18-22%.

## Some Important Points of Diet – Diabetes Relationship

Diet is an important factor in type 2 diabetes. Intake of fat in India is closely related to income (Ghafoarunissa, 1996). It is observed that in both low and high income groups the omega-6 requirements are fully made but there is a distinct deficiency of omega-3 especially in high income groups as their diets are rich in omega-6 due to increased consumption of sunflower and safflower oil.

Clinical studies involving different species of animals have shown that eating less (caloric restriction) reduces the risk of cancer, diabetes, stroke and heart disease. Larsen (2004) reported that caloric restriction (CR) also benefited people on a study conducted by a group of American researchers. In their study, they compared a group of 18 volunteers who had been practicing CR for an average of six years with a group of 18 people who were eating a normal diet. The members of the CR group were found to have significantly lower levels of triglycerides, cholesterol and C-reactive protein and also significantly lower blood pressure and formation of atherosclerotic plaque in their arteries. However, eating less can result in nutrient deficiencies. Sanders et al. (1985) showed that with a low fat intake the difference in effects of omega 3 and omega-6 fatty acids are marginal. Das et al. (1984) showed that the undernourished have lower levels of plasma lipids and a favorable distribution of cholesterol among the lipid fractions from the point of view of vulnerability to development of atherosclerosis. A person on a low-fat, high-carbohydrate diet utilizes the fatty acid synthetic pathway extensively; this pathway requires citrate to leave the mitochondria to generate malonyl-CoA. The resultant high concentration of malonyl-CoA inhibits the activity of the enzyme that is the gateway to fatty acid oxidation. It is for this reason that extreme low-fat diets do not result in weight loss nearly as fast as one might expect. The burning of excess fat is actually inhibited by the high carbohydrate intake. In persons with low body fat and good lean mass, high carbohydrate intake spares the use of fatty acids and the medium chain fatty acids that are otherwise so quickly used for energy may accumulate above "normal" in membranes. Diabetes is linked with the rise in consumption of refined sugars and carbohydrates by examining the consumption of food macronutrients (fats, proteins and carbohydrates) (Adams, 2004). Harvard School of Public Health examined the long-term relationship between different types of dietary fat and the risk of type 2 diabetes. Polyunsaturated fatty acids (omega-3 fats found in fish and flaxseed, pumpkin seed, canola, soy, and walnuts) appear to reduce the risk of diabetes while trans-fatty acids was responsible for the increase in incidence. (Harvard School of Public Health, 2007).

## Diet in Rural Bengal

The data obtained from about 5000 rural volunteers and analysed by the method suggested by Rangana (1986) presented in Table 1 (Food Constituents as Consumed by Semi Urban and Rural People), however, showed that the diet did not have a strong relationship compared to the level of income in the rural population. This may be due to selection of low cost food materials capable of supplying necessary food components and energy required for normal activities (Mitra, 2002). The above data for further analysis revealed saturated fat intake was about 6-8% except in higher income semi-urban population where it was about 15-18%, polyunsaturated fat intake is about 2-5% and monounsaturated fat intake is about 2- 4%. Fibre intake was about 30-40%. With rural diet a long-term study revealed that rural diet is diabetogenic in nature (Mitra and Bhattacharya, 2005). The

**Table 1: Food constituents as consumed by semi urban and rural people**

| *Total Income per family per month* | *Semi Urban or Rural* | *Protein (%)* | *Fat (%)* | *Carbohydrate (%)* | *Approximate Calorie* |
|---|---|---|---|---|---|
| <1000 | Semi Urban Rural | 10-1210-15 | 1010-15 | 8065-75 | 1600-1800 |
| 1000-5000 | Semi Urban Rural | 15-2010-15 | 15-2010-15 | 70-8065-75 | 2000-2200 |
| >5000 | Semi Urban Rural | 2510-15 | 20-2510-15 | 50-6565-75 | 2250-2400 |

increased prevalence of diabetes in India has a lot to do with a switch from a traditional to a Western diet. Eating fiber-rich foods gives a sense of fullness. If, like many Americans, one eating a lot of refined carbohydrates such as soft drinks and candy bars—or even pretzels and crackers – leads to feeding a vicious circle in body that never really satisfies hunger because one gets only short-term relief (Healthy Woman, 2004).

**Some Important Life-style Factors**

With modernization and globalization traditional rural Bengal is changing. Rural people prefer to go by two-wheelers and look it as status symbol. Sedentary lifestyle, genetic susceptibility, environmental and lifestyle changes resulting from industrialization and migration to urban environment from rural settings could be responsible for high incidence of the disease. While most people get diabetes if their body-mass index is 30-31, in the case of Indians, a body-mass index of above 25 is enough for them to get diabetes. The ideal body mass index by international standards is 25 and below, but the ideal body mass index for an Indian should be 23 and below (http://news.hitavadaonline.com/news/index.php?mode=singleandpage=11andn=6546). This truncal obesity, together with hypertension, insulin resistance, high triglyceride and low HDL-cholesterol, form a syndrome that we call the "metabolic syndrome", truncal obesity being the main component of this cardio-damaging disease. What's worse, the persistent high blood sugar causes the blood, blood cells and also the artery wall cells, including the heart, kidney and brain arteries, to be sticky. This promotes blockages in the artery wall. To reiterate, obesity causes insulin resistance and fat metabolism disorder, which in turn causes hypertension and diabetes mellitus, which in turn causes coronary artery disease (Swee Choon, 2006). Compared to the Chinese, the Europeans, or the Koreans, urban Indians do not have the habit of exercising. Sporting activities are not part of the Indians' lifestyle, which prefer a sedentary life to an active life. Indians, frankly, prefer sitting in front of the television to taking a walk. It is thought that Western lifestyle, when it collides with foreign cultures, can prompt rise in obesity rates and consequently metabolic syndrome, pre-diabetes and eventually type 2 diabetes (http://news.hitavadaonline.com/news/index.php?mode=singleandpage=11andn=6546).

**Birth Weight and Childhood Developments**

The results of a long follow-up of children from birth to 30-35 years have brought out certain factors during early childhood that lead to diabetes in later life. In a meticulous analysis of the children whom are followed from birth through their early adulthood, the researchers found that heavy mothers give birth to bigger babies who later on become obese adults. It was also found that, paradoxically, the babies who have a low birth weight tend to grow rapidly in childhood and become obese adults. This phenomenon is already noticeable in the developing countries where with availability of better nutrition, particularly for boys, there are sudden spurts of growth leading to obesity, which in turn is an important factor in the development of diabetes. The critical period of growth for the children is early childhood and indeed even earlier than that, the intrauterine life. These observations point towards the possibility of intervention during these phases of life, which makes more economic and medical sense than developing drugs for diabetes. The fasting glucose level in the children was not high to begin with but stressing the system by giving higher dose of glucose brings out the presence of diabetes. The efforts need to start during the intrauterine life, early childhood and adolescent life. An enormous effort to educate the community is needed. Infants who are at the highest end of the distribution for weight or body mass index or who grow rapidly during infancy is at increased risk of subsequent obesity (Baird et al., 2005).

**Difference in Dietary Pattern on Socio-Cultural Domains**

Interpopulation differences exist in both diet and the socio-cultural factors both within and outside the subcontinent. Diversity of Indian population in intake of food, life-styles, socio-cultural beliefs etc are possibly due to different socio-cultural backgrounds. Type 2 diabetes prevalence rates are higher on the east coast of Andhra Pradesh, particularly Eluru and Tenali, where rice is traditionally consumed as only cereal were higher compared with urban and rural Hyderabad, mainly wheat eating community. The dietary pattern, eating and methods of cooking vary in different parts of India (Ramaiya et al., 1990). Reddy et al. (2002) had shown that a high prevalence of diabetes in the Andhra and

Rayalaseema regions, hypertension in the Andhra region, and smoking in the Rayalaseema region. Lipid disorders were equally prevalent in all the regions. The long term effects of intermittent starvation and the pathological metabolic stress consequent to it on the course of glucose tolerance are not known still yet though some populations in India, where incidence of diabetes is on higher side (tribal belts of Rajasthan and Gujrat) consume very little protein on some days and an alternate starvation-excess cycle exists (Ramachandran et al., 1990).

**Difference in Prevalence of Diabetes**

It was observed while studying rural Bengalee populace that in certain regions incidence of diabetes was less, though major dietary ingredients and life-style factors were not altered. On careful analysis it was observed that in those selective pockets people are taking different herbal ingredients.

**Herbal Ingredients Used by Tribes**

On Binpur area, one small populace is taking 21 tulsi leaves per day.Tulsi is known for its anti-diabetic potentials (Mitra and Bhattacharya, 2006). Because of its inherent botanical and biochemical complexity, *Tulsi* standardization has, so far, eluded modern science. Perhaps best known of the many active compounds that have been identified and extracted are eugenol, ursolic acid, apigenin and luteolin. Although Tulsi is known as a general vitalizer and increases physical endurance, it contains no caffeine or other stimulants and is very rich in anti-oxidants (Mitra and Bhattacharya, 2007).

In Jhargram area some villagers use banyan bark and leaves about 12/day (Mitra, 2007). A decoction of bark is to be prepared and consumed twice daily in a dose of 40 to 80ml. The decoction is prepared by taking around 25-50gms of bark to which 4 cups of water are to be added (100ml of 10% solution). It is heated to make one cup, which has to be consumed. So far, some compounds called leucocyanids have been isolated from the tree and these compounds could be associated with the anti-diabetic activity of the plant. However, more research needs to be completed to understand the medicinal properties of this symbolic tree. The plant is not reported as being used medicinally in Europe and there are no documented cases in the literature of toxicity from its use in Britain (Deshmukh, 1960; Shrotri and Aiman, 1960; Vohra and Parasar, 1969; Vohra and Parasar 1970; Singh et al., 1992). The latex obtained from the aerial parts of the plant (leaves and young branches) and mixed with honey and use orally to control high blood glucose level (http://www.ayurvedinstitute.com/diseases_diabetes2.htm). It is less effective in patients with normal sugar and the effect is due to glycosides (Bengalenoside) (Satyavati et al., 1989). Fiscus contains albuminoids (fruits), caoutchouc, carbohydrates, fibers, flavonols, friedelin (leaves), glycemic principles and glycoside (bark), oil (fruit), quercitin-3-galactoside (leaves), rutin and sitosterol (leaves), subramanian (heartwood), tannins 10% (bark and buds), taraxosterol acid ester, tigilic acid ester, triterpene (leaves), wax (Blake, www.naturalhealth wizards.com).

In Jhargram area also selective people use flax oil as edible oil and salad oil. Flax oil is rich in omega-3 and omega-6 fatty acids and is beneficial in a diabetic (Mitra, 2007).

In a selective group in Nayagram area some people, particularly young ladies take young buds of china-rose (Hibiscus) 3-4/day and it is as a religious practice daily before worship. China-rose contains Cyanidin diglucoside, carotene, thiamin, riboflavin, niacin and ascorbic acid. Fasting blood sugar and serum insulin values (Boehinger Manheim, 1983) of these group was low with increased insulin sensitivity as observed by us on experimental testing of these bio-chemic values maintaining identical conditions with control.

In a selective group in Kontai area some people use Putranjibi leaves (*Putranjiva roxburghii*). 14-15 leaves were boiled with 500 cc of water till it was reduced to half and was filtered to remove the residue, cooled and taken four times a day as a vitalizer. It was observed that both fasting blood sugar and serum insulin values (Boehinger Manheim, 1983) were reduced with increased insulin sensitivity.

It was observed that Santhals residing near Orissa broder were using Gurmur leaves daily (5-6/day) as anti-diabetic measures. Mitra and Bhattacharya (2007) used a composite with Gurmur and tested it in newly diagnosed type 2 diabetes patients between 45 and 60 years of age for 4 weeks. The parameters used for evaluation were blood glucose levels and glycosylated hemoglobin ($HbA_1c$). Of the three cardinal symptoms for diabetes, a marked reduction was observed for

polyuria (the production of large volumes of urine). The other two symptoms, symptoms polyphagia (gluttonous excessive eating) and polydipsia (abnormally intense thirst), initially observed were disappeared by 12 weeks. Control of both fasting and postprandial blood glucose was achieved in about 55% of patients. Only 7% of the patients attained control of $HbA_1c$ by 4 weeks. None of the patients reported any side effects.

## CONCLUSION

In Bengal dietary habits is as per income in non-tribal and in case of tribes it depends on particular tribal culture. Selective areas have selective incidence of diabetes depending on food and life-style factors. While in non-tribal areas food and life- style factors maintain a homogeneity, in tribal areas it is not. In Bengal main tribes are Asur, Birhor, Korwa, Lepcha, Munda, Santhal etc. Their dietary and life style factors need to be extensively studied to draw a reasonable conclusion.

## REFERENCES


Adams, Mike. Wednesday, May 12, 2004. Diabetes and obesity linked to the consumption of high fructose corn syrup and refined sugars. Retrieved February13, 2007 from http://www.newstarget.com/001054.html.

Baird, J., D. Fisher, P. Lucas, J. Kleijnen, H. Roberts and C. Law. 2005. "Being big or growing fast: systematic review of size and growth in infancy and later obesity." *BMJ*, 331 (7522): 929.

Bhaskaran, V.P., N. R. Rau, Acharya Satyashankar, Ravi Raj, S. Chinnappa, Koshy Metgud and A. Tarun. 2003. "Study of the Direct Costs Incurred by Type-2 Diabetes Mellitus Patients for their Treatment at a Large Tertiary-Care Hospital in Karnataka." *India Journal of the Academy of Hospital Administration*, 15(2): 7-12.

Blake, Steve. 2006. *Herbal Reference E-Books, Medicinal Plant Constituents.* Retrieved July 4, 2006 from http://www.naturalhealthwizards.com/.

Boehringer Mannheim. 1983. "Instruction sheets for manual assays". GmbH Diagnostica. Mannheim: Germany.

Das, S., B. B. Tripathy, K. C. Samal and N. C. Panda. 1984. "Plasma lipids and lipoprotein cholesterol in undernourished diabetic subjects and adults with protein energy malnutrition." *Diabetes Care*, 7(6): 579-586.

Deshmukh, V.K. 1960. "Isolation of a hypoglycemic principle from the bark of Ficus bengalensis." *Ind. J. Physio. Pharmacol*., 4: 182.

Ghafoarunissa. 1996. "Fats in Indian diets and their Nutritional and health Implications." *Lipids*, 31: 287-291.

Healthy Woman. 2004. "The Low-Carb Way to Weight Loss." *Prevention Magazine*, Retrieved on 14.2.2007 from http://www.diabetessymptom.net/news/news_item.cfm?NewsID=83.

Larsen Hans. 2004. Calorie restriction improves health. *International Health News*, Number 149, Retrieved December, 12, 2005 from http: //www. yourhealth base. com/ihn149ad.htm based on original article published in *New Scientist*, April 24-30: 12-13 (2004).

Mitra, Analava. 2002. *Neutraceuticals for Control of Non-Insulin Dependent Diabestes mellitus.* Ph. D. Dissertation (Unpublished), Kharagpur : IIT.

Mitra, Analava and D. Bhattacharya. 2005. "Effects of overall consumption, dietary patterns, cooking, on patients suffering from Non insulin dependent diabetes mellitus." *J. Interacad.*, 9(4):635-642.

Mitra, Analava and D. Bhattacharya. 2006. "Dose-dependent effects of Fenugreek Tulsi composite in Diabetes with dyslididaemia." *Internet Journal of Food Safety,* 8: 49-55.

Mitra, A., D. Bhattacharya and S. Roy. 2007. "Dietary influence on TYPE 2 Diabetes (NIDDM*)." J. Hum. Ecol.,* 21(2): 139-147.

Mitra, Analava. 2007. "Anti-diabetic Uses of Some Common Herbs in Tribal belts of Midnapur (West) district of Bengal". *Ethno-Med*, 1(1): 37-45.

Mitra, Analava and D. Bhattacharya. 2006-07. "Effects of a Cheap Composite in patients with Type 2 diabetes and Dyslipidaemia." *Indian Journal of Multidisciplinary Research* (in press).

Mitra, Analava. 2007. "Effects of a Cheap Salad oil in the management of Type 2 Rural Indian Diabetics with dyslipidaemia.: *J. Hum. Ecol.,* (in press).

Mohan, D., D. Raj, C. S. Shanthirani, M. Datta, N. C. Unwin, A. Kapur, V. Mohan. 2005. "Awareness and Knowledge of Diabetes in Chennai -The Chennai Urban Rural Epidemiology Study [CURES - 9]." *JAPI*, 53: 283-287.

Official home page of The Hitavada. 2006. Hyderabad emerging as diabetes capital of India dated Feb 17, 2006. Retrieved April 19, 2006 from http://news.hitavadaonline.com/news/index.php?mode=singleandpage=11andn=6546.

Official home page of The Hitavada. 2006. Hyderabad emerging as diabetes capital of India. Retrieved April 23, 2006 from http://news.hitavadaonline.com/newsindex.php?mode=singleandpage=11andn=6546.

Official Home Page of Harvard School of Public Health. 2007. Fats and Cholesterol, Fats and Cholesterol - The Good, The Bad, and The Healthy Diet. Retrieved February 12, 2007 from http://www.hsph.harvard.edu/nutritionsource/fats.html.

Official Home Page of Ayurveda institute. 2007 . The Ayurvedic mode of management of Diabetes. Retrieved on 13. 2. 2007 from http://www.ayurved-institute.com/diseases_diabetes2.htm.

Park, K. 2000. *Park's Textbook of Preventive and Social Medicine*. Jabalpur: Banarsi Das Bhanot.

Ramachandran, A., C. Snehalatha, A. Kapur, V. Vijay, V. Mohan, A. K. Das, P. V. Rao, C. S. Yajnik, K. M. Prasanna Kumar and D. Jyotsna Nair. 1990. "High prevalence of diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey." *Diabetes Metabolism Review*, 6: 125-146.

Ramaiya, K.L., V. R. Kodali and K. G. Alberti. 1990.

"Epidemiology of diabetes in Asians of the Indian subcontinent." *Diabetes Metab. Rev*., 6: 125–46.

Rangana, S. 1986. *Hand Book of Analysis and Quality Control for the Fruit and Vegetable Products*. New Delhi: Tata McGraw Hills Limited.

Reddy, N.K., D. N. Kumar, N. V. Rayudu, B. K. Sastry, and B. S. Raju. 2002. "Prevalence of risk factors for coronary atherosclerosis in a cross-sectional population of Andhra Pradesh." *Indian Heart Journal,* 54(6): 697-701.

Sanders, T.A.B., F. R. Oakley, G. J. Miller and K. A. Mitropoulous. 1985. Influence of n-6 versus n-3 polyunsaturated fatty acids in diet low in saturated fatty acid decreases during long term compliance with a lipid lowering diet. *J. Internal Medicine*, 59: 249-258.

Satyavati, G.V., Niraj Tandon, and Madhu Sharma. Madhu. 1989. "Indigenous plant drugs for diabetes mellitus." *Diabetes Bulleta*, 181 Q: 1-32.

Shrotri, D.S. and R. Aiman 1960. "The relationship of the post absorptive state to the hypoglycemic action. Studies on ficus bengalensis and ficus glomerata." *Ind. J. Med. Res*., 48: 162.

Special Correspondent. 2004. "Diabetes: prevalence rate `fastest' in India." *The Hindu Andhra Pradesh,* Online edition, Friday, Jul 02, 2004 p1.

Singh, N., S. D. Tyagi and S. C. Agarwal. 1992. "Study of antidiabetic effects of alcoholic extract of *Ficus bengalensis* (Linn) on diabetic albino rats." *J. Res. Ayurv. Sidha*, 13(1-2): 56-61.

Swee Choon, N.G. 2006. "Your Health Matters: Diabetes and the heart." Retrieved on 12. 3. 2006 from http://thestar.com.my/health/story.asp?file=/2006/3/12/health/13632636andsec=health).

Vaatsalya Team. 2006. "Diabetes Screening Camp at Hubli, Gadag and Karwar." *Decan Herald,* Daily September 22, 2006 p54.

Vohra, S.B. and G. C. Parasar. 1969. "Phytochemical and pharmacological studies on *Ficus bengalensis* Linn." *Ind. J. Physiol. and Pharmacol*., 13(3): 143.

Vohra, S.B. and G. C. Parasar. 1970. "Antidiabetic studies on *Ficus bengalensis* Linn." *Ind. J. Pharmacy*, 32(3): 68.

WHO. 1985. "Report of a WHO Study Group: Diabetes mellitus." *WHO Tech Rep Ser*. 727: 1–113, Geneva: WHO.