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Foreword

It is now well known that there is a pandemic of Type 2 Diabetes in the world particularly in developing countries. This fact has several implications for the health care system in the developing countries because this condition is associated with metabolic and vascular complications which in turn increases the mortality and health care costs and compromises the quality and life expectancy of the society.

It is therefore important to aim for primary prevention of diabetes particularly in countries where there is a high prevalence.

This manual aims to provide an overview of this subject to health care professionals, paramedics and other voluntary services involved in health care promotion.

The WHO Collaborating Centre for Diabetes in India is actively involved in prevention of diabetes, childhood obesity and other related disorders and is regularly bringing out such education materials to improve the awareness among all the people involved in health care.

We sincerely hope this manual will go a long way in preventing this pandemic of diabetes in the world particularly in the developing countries.

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Towards a healthier Nation... ...Steps for transforming disease to health

There are umpteen number of evidences to establish the fact that diabetes has reached EPIDEMIC proportions in India. There is a huge unparalleled burden of illness caused by diabetes. As the developing world is expected to bear the brunt of the escalating diabetes epidemic in the future, diabetes prevention is proving especially urgent and difficult in developing countries.

In India, health policies and services need to put more emphasis on non-communicable diseases such as diabetes. This manual is expected to benefit the general population and the health personnel in generating awareness on prevention of diabetes, and the policy makers in implementing prevention programmes on a nationwide basis.



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Around the globe news on diabetes *(courtesy IDF)*

- Diabetes is the fourth leading cause of global death by disease.
- Each year 3.8 million deaths are attributable to diabetes. An even greater number die from cardiovascular disease made worse by diabetes-related lipid disorders and hypertension.
- Diabetes is a common cause of kidney failure in developed countries and is responsible for the huge cost of dialysis.
- Diabetic retinopathy is the leading cause of vision loss in adults of working age (20 to 65 years) in industrialized countries.
- At least 50% of all people with diabetes are unaware of their condition. In some countries this figure may reach 80%.
- Upto 80% of type 2 diabetes is preventable by adopting a healthy diet and increasing physical activity

The Indian Scenario...

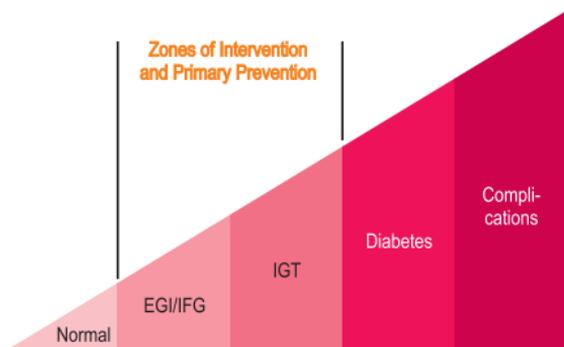
- In India, around **40.9 million** people are affected by diabetes

- Indians develop diabetes at an earlier age and with lower levels of obesity.
- Prevalence is escalating at very abnormal proportions in India.

These hard facts necessitate immediate action.

Evolution of Diabetes

Due to the natural history of the disease and stages in evolution, the **good news** is that Diabetes is **PREVENTABLE** at an early stage.



Pre - diabetes stage	
EGI	Early Glucose Intolerance
IFG	Impaired Fasting Glucose
IGT	Impaired Glucose Tolerance

For details see page 12

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Different stages in the development of diabetes mellitus:

Prevention Strategies

The contents of this manual are evidence based. This manual speaks on the most important level of prevention;

- (1) Health promotion,
- (2) Primary prevention

The goal of health promotion is to help people establish an active lifestyle and healthy eating habits early in life and to maintain this behavior throughout their lives.

The goal of primary prevention is to help those who are at risk of developing the disease and hence prevent or postpone the onset of disease by establishing more active lifestyles and healthier eating habits.

Primary prevention can be accomplished by promotion of health and reduction of risk factors through the individual and on a community basis.

For the programme on prevention of diabetes two approaches can be used.

High risk approach

- Focuses on the high risk group, involving individual counseling. This approach can also be used by the general practitioners while attending to patients and counsel the families for prevention of diabetes among the high risk groups.

Population approach

- The focus is on the entire population or community as a whole. This approach can be used where the prevalence is high and the entire community is targeted.



For example – Urban areas, metropolitan cities.

For good results in achieving a reduction in the prevalence and incidence of diabetes both the approaches are needed.

The function of protecting and developing health must rank even above that of restoring it when it is impaired.

– Hippocrates

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The focus of primary prevention can be on the following high risk categories:

Those with Pre-diabetes conditions [IFG & IGT]

Those with positive family history of diabetes

Those aged above 40 years

Stressful and sedentary jobs

People with high blood pressure and cholesterol

Increased Body Mass Index – BMI (General Obesity)

Increased waist circumference (central obesity)

Sedentary lifestyles

Women with history of high blood sugar during pregnancy

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Population strategy: Since Indians are genetically predisposed to the development of diabetes and have a lower threshold for the disorder, the best strategy that can be adopted is the population strategy. This may be combined with high risk approach to achieve greater success.

With an easy access to tertiary care centres and availability of complex comprehensive care the approach differs in an urban setting. Community intervention strategies aimed at the primary prevention of diabetes must include community-based exercise and healthy nutrition programs targeting people at a high risk for diabetes. Efforts could include advocacy for increasing the availability of diabetes education programs.

Five simple tools to identify high risk category;

- **Age above 40 years**
- **Positive family history of diabetes**
- **Increased abdominal fatness**
(Waist circumference Male ≥ 90 cms,
Female ≥ 85 cms)

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- **Pre-diabetes**
(Impaired fasting glucose ≥ 110 mg/dl
Impaired Glucose Tolerance 140-199mg/dl)
- **Sedentary lifestyle**

The table below shows the assessment of risk based on the number of risk factors present.

Positive family history with one or more risk factors	◀ High risk
Increased age with sedentary lifestyle and Increased waist circumference	◀ Moderate risk
Presence of any 1 risk factor	◀ Low risk
<i>Indian ethnicity always carries some risk</i>	

Simple diagnostic tests

- Fasting blood glucose
- Oral Glucose Tolerance Test(GTT)
- Measurement of body mass index and waist circumference
- Lipid profile
- Blood pressure
- Assessment of dietary habits
- Assessment of physical activity level
- Evaluation of stress

Diagnosis of diabetes and pre- diabetes conditions:

Conditions	GTT values in mg/dl		
	Fasting	1 hr PP	2 hr PP
Normal	< 110	-	≦<140
EGI – Early Glucose Intolerance	< 110	≧160	≦<140
IFG-Impaired fasting Glucose	110 – 125	-	-
IGT - Impaired Glucose Tolerance	-	-	140 – 199
Diabetes	≧ 126	-	≧ 200

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Calculation of Body Mass Index (BMI)

Body Mass Index (BMI) is an anthropometric index of general obesity which is calculated by using height and weight measurement.

$$\text{BMI} = \frac{\text{Weight in kgs}}{(\text{Height in meters})^2}$$

For example: Weight = 50Kgs.
Height = 150 cms
BMI = $50/1.5*1.5 = 22.2 \text{ Kg/m}^2$.

For Indian Adults,
BMI Upto 25 kg/m^2 is Normal,
BMI $\geq 25 \text{ Kg/m}^2$ is Overweight and
BMI $\geq 30 \text{ Kg/m}^2$ is Obese.

Waist Circumference

Measurement of waist circumference is a simple procedure which can be done at home using a simple measurement tape.

- Take off your shirt and loosen your belt
- Position the tape on the navel
- When taking measurement, the abdomen should be relaxed and you should be breathing out
- Record the measurement



For Indian adults,

Normal male - waist circumference
upto 90 cms

Normal female - waist circumference
upto 85 cms

“Those of you who fall in any of the above risk category must go for check up atleast once in 6 months”.

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Recommendations

Parameters	Optimum measurement	Recommendations
Blood sugar	<p>Always maintain your fasting blood sugar level below 110mg/dl.</p> <p>Post prandial blood sugar level after one and half hours should be less than 140mg/dl.</p>	<p>If fasting and post prandial sugar is above the specified limit, advocate lifestyle modification.</p> <p>Adopt a healthy diet</p> <p>Increase the physical activity by walking, jogging, swimming, involvement in sports, games and in health clubs.</p> <p>Stress reduction methods like yoga, meditation must be performed.</p> <p>Target towards reduction of weight.</p>
Body mass Index(Weight in Kgs/Height in metre ²)	<p>Always maintain a BMI of less than 25 kg/m². Any increase indicates overweight and becomes a risk factor</p>	<p>BMI>25kg/m² should target towards weight reduction</p>

Body weight	Maintain ideal body weight(Height in cms – 100).	Combined effort from lifestyle modification by doing strict diet control and regular physical activity. If obese, medications for weight reduction therapy must be considered along with LSM.
Blood pressure	For healthy people – Goal is to maintain 120/80 mm/Hg.For people above 40 years with a history of blood pressure maintain less than 140/90 mm/Hg	<p>Promote healthy lifestyle modification.</p> <p>Advocate reducing weight</p> <p>Reduce sodium (salt) intake.</p> <p>Take a variety of fruits, vegetables and low-fat dairy products</p> <p>Avoid fried foods and reduce oil consumption in any form</p> <p>Do atleast 30 minutes of physical activity everyday.</p> <p>Stop smoking and alcohol habits.</p>

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		Drug therapy is recommended for those with BP of 140/90 mm/Hg or higher.
Lipid profile	Maintain cholesterol level <200mg/dl. HDL cholesterol should be more than 40mg/dl in men and more than 50mg/dl in women. Triglycerides should be less than 150 mg/dl. LDL cholesterol should be less than 100 mg/dl.	If lipid profile is higher than the normal 1. Regular and daily physical activity for atleast 30 mins .2. Target towards weight reduction 3. Strict diet control.4. Consider drug therapy – lipid lowering agents if the profile is persistently abnormal in spite of Regular exercise and diet control.

Methods for creating awareness

Awareness education on primary prevention of diabetes can be done by the following ways:



Methods

- Camps – Screening and education camps.
- Awareness Campaigns/ programs
- Exhibitions/Fairs
- Seminars/Conferences
- Rallies/Walks
- Folk Arts

Channels

- Distribution of pamphlets, manuals, cards
- Advertisements in magazines, newspapers and other commonly read books.
- T.V, Radio, Media
- Health education curriculum in schools, workplaces.

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- Lectures in various places like, Public meetings, religious gatherings.
- Awareness programs by lecture and counseling in schools, colleges, offices, women's organizations

Personnel who can be involved in spreading awareness on primary prevention at the National level are

- Private health organizations
- Government bodies
- NGOs and local bodies
- Self help groups
- NSS and NCC scouts.
- Social and service clubs
- Health workers / Health educators
- Community welfare associations
- General Practitioners

This should never be a "ONE TIME" Program
but a
REGULAR ONGOING PROCESS.

Primary Prevention of diabetes in a rural setting

The methods for primary prevention of diabetes in villages may be slightly different from the urban areas due to non availability of easy access to tertiary care centres. The primary prevention programmes in the rural part of India must be done with the available infrastructure. The prevalence of diabetes in rural India varies widely anywhere between 2 to 6 % and even higher as obtained from studies from other parts of India.

Points for consideration

- The general conditions and risk factors of the disease vary considerably among the rural population.
- The rural population have a lower BMI.
- Physical activity is comparatively higher than their urban counterpart, however in recent times people have started using motorised vehicles and machines for agriculture, thereby reducing their physical activity level.
- Due to poverty and inaccessibility, the food consumed by the rural population is unbalanced diet – large proportion of rice with little or no vegetables and fruits.
- Access to tertiary care centres is minimal.

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- The prevalence is comparatively lesser than the urban population.

Hence the approach for education on prevention of diabetes differs from the urban.

High Risk approach

Those at high risk must be identified and focus of prevention must be on the individuals and their family. Please refer pages 9 to 11 to identify high risk category.

The contents under urban setting may be followed as appropriate and if applicable to rural areas.

Salient points for rural setting

1. The target high risk groups can be counseled for prevention of diabetes.
2. Focus should be made on changes in diet pattern after initial assessment of dietary habits.
3. The role and importance of increasing physical activity should be stressed.
4. The primary health centres, village health nurse and the workers at grass root level, panchayat heads may co- ordinate in awareness programmes and other educational activities related to diabetes prevention.

Guidelines for Lifestyle Modification in a nutshell

Lifestyle modification involves modifying and regulating the changes in all the day to day activities of life like diet, physical activity, beliefs and behaviour. All these together influence the body health status.

Physical Activity

1. Increase activities like walking, jogging, skipping, swimming.
2. Walking should be increased gradually. About a Km in 20 mins which can be increased to 2 kms in 20 min over a week's time. Ideal is a continuous walk for 30 mins daily.
3. Use the stairs instead of the lift. Just 10 minutes of stair climbing is equal to 30 minutes of walking.
4. Use bicycles for short distances instead of a motorized vehicle.



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5. Get involved in outdoor sports rather than indoor games.
6. Spend leisure time in activities like gardening or exercise
7. Minimize TV watching
8. Reduce the time spent in playing computer games or aimless internet browsing.
9. Those with sedentary jobs can include atleast 30-45 minutes of exercise daily.

Stress reduction

1. Do yoga and meditation to relieve stress.
2. Deep breathing exercises can also be done to reduce stress.
3. Regular practice of relaxation techniques like listening to therapeutic music.



Dietary modification



1. Aim for negative energy balance (i.e.) food intake should be less than the energy expenditure.
2. Include vegetables and greens in the main meals.
3. Plenty of fruit consumption is recommended but avoid fruits in juice form.
4. Increase foods rich in fibre content and decrease carbohydrate contents
5. Moderate intake of food rich in proteins and cereals
6. Minimize taking food rich in fats and fried food.
7. Avoid sweets and milk products in all forms.
8. Avoid snacking in-between major meals and while watching TV.

Lack of commitment in LSM does not serve the purpose. There should be a committed and combined effort to achieve the goal of good health.

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Role of healthy and balanced diet

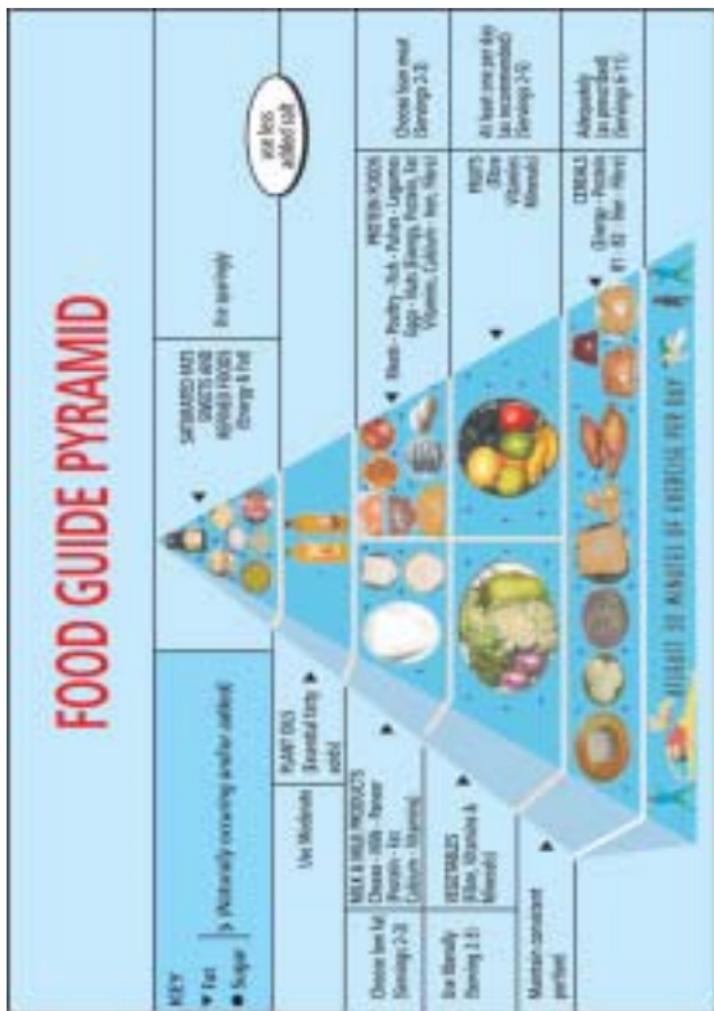
A diet high in nutrients is the key to good health. In order to maintain your body weight one should take a balanced diet.

A diet which has all the nutrients such as carbohydrate, protein, fat, vitamins, minerals in appropriate proportion is called a balanced diet.

Food Guide Pyramid

Food Guide Pyramid is a visual representation of the variety & proportion of foods that could be included in a day's diet. The different food groups are arranged in the form of a pyramid.

- The base of the pyramid contains **cereals & starches** which provide the major part of the day's energy. All cereals could be included, in their respective quantities prescribed to you. This group contributes carbohydrates to our body.
- The next level is shared by **fruits & vegetables**. Adequate intake of these provides antioxidants, vitamins, minerals & fibre. 1 fruit per day is recommended. About 500gm of vegetables (in any



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form like soup, salad etc) per day needs to be taken to meet the requirement of vitamins and minerals.

- **Protein foods** (vegetarian food like legumes-dhal & wholegrams, & Non-vegetarian food, like fish / chicken /egg white) and low fat milk / milk products form the next level. The quantity of these foods would vary for each individual.
- **Nuts and oils** form the fourth level in the pyramid. A handful of boiled/roasted nuts can be taken daily. For those who are overweight/ obese, nuts could be included occasionally by doing adjustments in the fat consumption.
- The tip of the pyramid contains **sugar, saturated fat and refined foods** which should be taken sparingly. Oil intake should be limited to 25-35 ml/day. Oil consumption should be reduced for people with obesity.

Types of food	Preferred	Avoid
Cereals	All whole grains cereals such as Whole wheat, oats, ragi, millets brown rice etc	Maida, polished rice, refined food products, instant preparations.
Pulses	Dhals or grams with outer capsules (Skin) and Sprouts	Fried food such as vada, bonda, fried dhals
Vegetables	Vegetables rich in fiber like greens, brinjal, cauliflower, gourds, salads	Frying, deep frying, pickle, dehydrating the vegetables
Fruits	All fresh, frozen fruits and dry fruits	Canned, Bottled, Juice, Squash
Dairy Products	Skimmed milk, Unsweetened yoghurt, curd, buttermilk	Cheese, ghee, ice cream, milk cream, Whole milk
Meat products	Fish, chicken, egg white – Boiled, steamed, grilled, roasted, barbecue or stew	Red meat, organ meat, egg yolk, frying and deep frying

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Sugar and sweets	Sugar, honey, jaggery - 3-4 tsp a day	Sweets prepared with oil and vanaspathi
Oils	Olive, groundnut, sunflower, safflower, Gingely oil – 25- 30 ml/day	Palm oil, coconut oil, lard, vanaspathi , refined and processed oil
Beverages	Water, Buttermilk, Clear soups, Tender coconut water	Tea, coffee, aerated drinks, soda,alcohol.

Water: Drinking more water keeps your stomach full and suppresses the appetite which will reduce your food intake.

Fiber: Foods rich in fibers are low in calories and gives fullness to your stomach easily. Foods like apple, pineapple, papaya, strawberries, broccoli, cauliflower, lady's finger, brinjal, stem of plantain plant and whole grains are rich in fibers.

Good fats: We need some essential fatty acids (good fat) for our body for the normal metabolism. This fat will naturally reduce the bad fat in the body. Fish, Walnuts, pistachio, flax seeds, pumpkin seeds, soyabean, canola oil, and cotton seed oil are the richest source of essential fatty acids.

Guidelines to doctors

1. Display charts and posters in your clinic on prevention of diabetes
2. Spread awareness on healthy lifestyle during clinical practice
3. Do one to one counseling of high risk group during general practice
4. Advice and motivate the families of your patients to adopt a healthy lifestyle in a short and crisp manner
5. Your nurses and assistants can also give advice and spread awareness on diabetes prevention among your general patients during the routine practice
6. Blood glucose tests in high risk categories are recommended

Guidelines to healthworkers / NGOs

1. Identify those at high risk
2. Give adequate advice on healthy lifestyle habits
3. More counseling should be done particularly to those with family history of diabetes

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4. Propagate the message of prevention of diabetes even while addressing on any other subject or disease
5. Utilize a lot of display items and pictorial representation for easy understanding of the message among the people
6. Multi lingual lectures, creating public friendly atmosphere and individual counseling can be done to create awareness.

Guidelines for the general public

1. Though knowledge plays an important role in maintaining good health, attitude is solely responsible for preventing diseases
2. Implement healthy lifestyle techniques as advised by the doctors and the media to prevent diabetes
3. Be more cautious if you are overweight or have a family history of diabetes
4. Try and adopt lifestyle modification if you have a sedentary or low physical activity
5. Inculcate healthy eating pattern among your children during early childhood and discourage fast food and junk food habits.

Ten Commandments for prevention of diabetes:

1. Adopt “Eat less and walk more” principle
2. Aim for ideal body weight
3. Minimize sugars and sweets
4. Avoid food rich in fats and oils
5. Eat plenty of vegetables greens, grains and fruits
6. Those with sedentary jobs can include atleast 30-45 minutes of exercise daily.
7. Minimize T.V.watching and spend leisure time in activities like gardening or exercise
8. Check your blood sugar and blood cholesterol levels if you are in the high risk group.
9. Practice yoga, meditation and other relaxation techniques for stress control
10. Those at risk must be more cautious and aim for healthy habits to prevent diabetes