Health Problems for Diabetics Disease in Urban Bangladesh

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Abstract

Diabetes mellitus is a group of metabolic disorders characterized by chronic hyperglycemia with disturbance of Carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction and failure of various organs, specially the eyes, kidneys, nerves, heart and blood vessels. Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the beta cells of the pancreas with consequent insulin deficiency to abnormalities that result in resistance to insulin action. The basis of the abnormalities in carbohydrate, fat and protein metabolism in diabetes is deficient action of insulin on target tissues. Deficient insulin action results from inadequate insulin secretion and /or diminished tissue response to insulin at one or more points in the complex pathways of hormone action. Impairment of insulin secretion and defects in insulin action frequently coexist in the same patient, and it is often unclear which abnormality, if either alone or both is the primary cause of the hyperglycemia. Diabetes mellitus may present with characteristics symptoms such as polyuria, polydipsia, weight loss with sometimes polyphagia, and blurred vision. Impairment of growth and susceptibility to certain infections may also accompany with chronic state of hyperglycemia. Acute life-treating consequences of diabetes are hyperglycemia with ketoacidosos or non-ketotic hyperosmoler syndrome. Long-term complications of diabetes include retinopathy with potential loss of vision; nephropathy leading to renal failure; peripheral neuropathy with risk of foot ulcers, amputation and Charcot joints; and autonomic neuropathy causing gastrointestinal, genitourinary, and sexual dysfunction. People with diabetes are also greatly increased risk of cardiovascular disease.

Key words: Diabetics, Physical exercise, Prevalence, Risk Factors, Diabetic retinopathy, Heart Disease, Blood Pressure

INTRODUCTION

According to the report of the Bangladesh department of statistics and health information cell, the health indicators and health facilities show better health conditions in urban population compared to rural. But there are important differences related to accessibility to health care and health status among the different strata of urban population. The urban slum population has a lower rate of immunization coverage against all antigens about 58 percent, compared to 77 percent in non-slum areas. Contraceptive use is 50 percent in the slum and 58 percent in the non-slum areas and antenatal coverage in urban slum is about 55 percent lower than the nonslum areas. Infant mortality rate is 80 (per 1000 live births) and under-5 mortality rate is 140 (per 1000 live births) in urban slums which are ranked the highest in the world. In Bangladesh more that 90 percent of the children are malnourished and 25 percent of the families live below the line of hard-core poverty. In urban slums 39 percent babies are born with low birth weight (< 2.5kg) compared to 23-27 percent in other urban areas. In urban slums, infant death registries showed 45 percent among of all deaths. Fifty four percent of infant deaths are related to vaccine preventable diseases. But over the years there have been some remarkable success in control and prevention of communicable diseases in urban and rural areas, while non-communicable and chronic diseases are increasing. It has been shown that now a day Diabetes, Coronary Heart Diseases (CHD), Hypertension, neoplastic and mental diseases are becoming a growing threat for the urban population.

Urbanization and its consequences for development of chronic diseases. Any country that experienced to urbanization and industrialization also witnessed with a change of disease pattern from infectious to non-communicable and chronic diseases. In the last two decades Bangladesh was experiencing fast urbanization, expanding industrialization, rising income and improved primary health care services resulting in increased life expectancy at birth longer than 60 years, Primarily due to so far success in reducing child mortality. But changing in life styles, eating habits, sedentary life, increased use of tobacco and deteriorating environmental conditions are likely to develop non-communicable diseases. At the same time no communicable diseases and metabolic disorders linked with diabetes (DM), hypertension (HTN) and coronary heart diseases (CHD) are increasing.

Diabetes mellitus, a chronic disease once thought to be uncommon in Bangladesh, but now it has emerged as an important public health problem. At present it is estimated that about 3.6 million people are affected throughout the country. The prevalence of diabetes in adult varied from 2.2 percent to 8.0 percent and the higher prevalence was found in urban areas predominantly among women. Unfortunately, there is still inadequate awareness about the real dimension of the problem in the general public. There is also lack of awareness about the existing interventions for preventing diabetes and management of complications.

OBJECTIVES OF THE STUDY

The objectives of the study are as follows:

1. To estimate the prevalence of type 2 diabetes among the urban slum dwellers of Dhaka city.
2. To make a valid comparison in differential prevalence and its related risk factors compared to its source population i.e. rural.

RESULTS

We have observed a significantly higher prevalence of type 2 diabetes among the urban slum population 8.1% compared to our rural population 2.3%($p<0.01$). Earlier studies in Bangladesh showed the prevalence of type 2 diabetes in urban population was 7.9% and in rural population 3.8% in the age category 30-64 years. In our urban population the prevalence of diabetes increased

about four times higher compared to rural subjects. The findings of our urban study showed similar and consistent results with other Indian studies and studies performed in Bangladesh. Our rural study showed somewhat lower prevalence of diabetes compared to a previous rural study in Bangladesh probably because of lower age composition in our population >20 years and different diagnostic procedures applied. However, FBG did not appear o underestimate the prevalence's of DM compared to 2-h BG values either in rural or urban population.

The differences in prevalence cannot be explained either by obesity or central adiposity, hypertension or by soviet-economic status. This may indicate the stressful life conditions, unfavorable settings rather than traditional belief that modified food behavior as a consequence of urbanization will result in higher obesity. This in turn will increase DM to metabolic syndrome.

The prevalence of diabetes increased with increasing age both for urban and rural population. This observation is almost uncontroversial. In our urban population in each age category, there was almost three to five fold higher prevalence of diabetes compared to rural population and the risks increased by an incremental order for the development of diabetes for the older subjects compared to younger both in urban and rural population.

We have observed a higher occurrence of diabetes among females in all age categories compared with males both in urban and rural and the prevalence of diabetes was found to be even higher among the females following 2-h glucose tolerance procedure but the differences were not statistically significant. In our urban subjects we found two fold increased prevalence of diabetes among females in the age category 41-50 years Compared to males (20.4% vs10.5%).

The findings of the predominance of the state by sex in this population were consistent in previous studies. Although the reason for this phenomenon is unknown but women appeared to have higher BMI compared to males. The higher BMI among women compared to men also observed in Indians and Pima Indians study. The higher prevalence among women than their male counter parts in our population is not known but possibly women had under nutrition in their early infancy or fetal life or may have some roots in the traditional practices make female neglected both as mothers or infants. The mean blood glucose levels for females showed a fairly different value compared to male following FBG in our urban and rural population and these differences were more distinct following OGTT for a selected subject. Female had a significantly higher BG values in their early life for rural subjects compared to males following OGTT and a similar pattern of BG levels were also observed among the urban subjects up to age of 50, after which female had markedly lower mean BG values.

Systolic hypertension (sHTN >140 mmHg) was marginally associated with the occurrence of type 2 diabetes in our rural population following FBG but this association was not retained after OGTT. This may have occurred as a result of lower numbers of participants were investigated in 2-h post glucose procedure. In compared to rural population no association was observed with blood pressure and DM in urban population. Hypertension in our lean population was found to be almost non-existing. But in a selected rural study found the prevalence of sHTN and dHTN was 10.5% and 9.0% respectively. Literacy showed an important association for the occurrence of diabetes in our urban subjects. Literacy may be associated with better economic condition and thereby a proxy indicator for socio-economic status. Earlier studies in Bangladesh have also shown that the risk of diabetes was higher among the people with improved socio-economic status.
Waist-to-hip ratio was found to have a statistical association for the development of DM for male both in urban and rural subjects but this association was not apparent for the women. Our male population showed 39 % higher waist/hip ratio (WHR>0.9) though evidence of normal BMI, which may explain as an excess accumulation of body fat in the abdominal region other than, hips and lower extremities. It may be hypothesized that our population remained undernourished in their infancy and adolescents' periods and their food intake increased at adult life resulting in increased central adiposity other than generalized obesity that may cause insulin resistance, metabolic syndrome and type 2 diabetes.

Generalized obesity measured by body mass index (BMI) appeared to recognize as a prime indicator for the development of type 2 diabetes. Our study population both in urban and rural, represented a lean population with a mean BMI (urban-19.4 and rural-20.2) and only 3.6 % in rural and 6.2% in urban population were defined as overweight. We did not observe any significant association between BMI and DM following FBG or OGTT either in urban or rural subjects. But there is an exceeding risk for the development of diabetes among the obese; however, no conclusion could be made as fewer numbers of subjects belonged to this category. As it has been shown that the prevalence of diabetes was significantly higher among the urban migrants compared to its source population despite of similar levels of obesity status, This may be explained that most of the study subjects were hard core poor people and had low birth weight and or under nutrition in their infancy which could be attributed for rising prevalence of diabetes in adult life. In addition, stressful life conditions and traumatic environmental settings of urban slum may have added to its manifested risk as LBW babies from infancy.

Further, it is also possible that we are witnessing a unique form of type 2 diabetes in this population comparable to the Indian population in this sub-continent where more than 60 percent of type 2 diabetes cases are non-obese and many are actually lean with body mass index <18.5 and referred as "lean type 2 diabetes" .

The evidence may call for readjusted BMI cut-off values in the local context in order to identify people for metabolic syndrome. However, we need to understand the metabolic and hormonal profiles from future studies in order to establish culturally sensitive BMI categories.

Situation of type 2 diabetes in Bangladesh
Bangladesh is a densely populated country having approximately 130 million people in an area of 144000 sqkm. Despite of having a well-structured health care delivery system, people are increasingly suffering from a variety of chronic health problems. Diabetes mellitus particularly type 2 diabetes is now recognized as a major chronic public health problem in Bangladesh. The

magnitude of diabetes remains unknown due to lack of countrywide survey. More than 80% of country population lives in rural areas but some studies showed that the prevalence is higher in urban areas. However, some small-scale survey conducted by Mahtab et, al (1983), Ali et, al (1985) and Sayeed et, al (1985) showed that the prevalence of DM in the age group >15 years varied from 1.0 to 1.5% in urban areas and 0.5 to 1.0% in rural areas .

Sayeed et, al in 1995 conducted a study in rural Bangladesh and found the prevalence of type 2 diabetes was 2.1% (male 3.1% and female 1.3%). Age adjusted (30-64 years of age) prevalence was 2.23%. Recently, another study in 1997 among the rural, urban and sub urban population of Bangladesh showed that the combine prevalence among the rural and urban population was 5.2% of which rural prevalence was 3.8% and urban prevalence was 7.8%. Age adjusted (30-64 years) prevalence urban 8.0% and rural 3.8%.

An increasing trend of diabetes registration in all the referral centers in Bangladesh has been noticed in recent years. From Diabetes registry in Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), it was found that the number of registered diabetes in the year 1956 was 39, which has been increased to 15,296 in 1998.Among the registered diabetic patients, on average 60 percent are male and 62 percent from urban, 32 percent from rural and 6 percent from semi-urban. The overall estimated prevalence of diabetes in Bangladeshi population is 5.6% and in which more than 96 percent is reported to have type 2 diabetes. If the trend continues to grow in this population where the growth rate is 1.8% and in approximately 130 million people the problem of DM as a health issue should certainly alarm the health planners.

Existing Diabetes Health Care Services in Bangladesh

The comprehensive diabetic health care delivery in Bangladesh is a unique program of Diabetes Association of Bangladesh (DAB). The Association executes its program primarily through its central institute called the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), and through the Satellite Diagnostic Clinic at different peripheral region to provide services at doorsteps. The association was established on 28th February 1956 in Dhaka at the initiative of the late National Professor M Ibrahim and a group of social workers, philanthropists, physicians and civil servants. Over the year the Center has turned into a diabetes care and research complex at Shahbag, Dhaka. After the demise of Prof M Ibrahim in 1989, it has been renamed as the Ibrahim Memorial Diabetic Center. Ibrahim Memorial Diabetes Center is a 550-bed teaching and training hospital affiliated to BIRDEM. Now days, BIRDEM is recognized as the Center of Excellence and Reference center in diabetes care.

To improve the diabetic care and enlarge the service for a wide range of population, Diabetic association has established National Health Care Net Work (NHN) throughout the country. A four-tier network has been envisaged with the central being at the capital, the Supra Regional Diagnostic Center in Division, Regional Diagnostic Center at Division, Regional diagnostic Center at District and peripheral Diagnostic centers at the Thana levels. The need for such a diagnostic network emanated from the pressure of diabetic and no diabetic patients at BIRDEM. With the pressure gradually mounting provision of health care from one single source become impossible. The implementation of NHN programs was started in 1999-2000 and it provides service through the central laboratory and 10 centers in Dhaka city. In addition to diagnosis, the NHN center provided services to the out patients departments for the treatment and certain test free of cost.

Prevalence of type 2 diabetes in urban slum of Dhaka, Bangladesh

The paper attempts to describe the prevalence of type 2 diabetes and its associated risk factors among the urban slum population in Dhaka, Bangladesh. This study was conducted among the urban migrants from a selected rural area. The study subjects were in transitional stage of urbanization with little change of their traditional rural life and most of them were hard-core poor. Earlier we have conducted another prevalence study in the rural areas about 35 miles north from the Dhaka city in the district of Gazipur and Tangail in 1999. We undertook the study in two slums of Dhaka metropolitan area among the migrants from those specific rural areas in 2001.

In this cross-sectional survey we investigated 1555 individuals randomly both male and female > 20 years of age. For estimating the prevalence of diabetes we performed fasting capillary blood glucose (FBG) and 2-h post glucose test for a selected number of subjects. We also measured some important anthropometrical indicators (HT, WT, waist and hip girth) including systolic and diastolic blood pressure. Further, Demographic and socio-economic information were collected following a pre-tested structural interview. For diagnosis and defining the diabetes state in our study population we used revised WHO criteria.

Among our study subjects 731 were male, 824 were female, most of the population was young with a mean age 33 years, and about 78 percent were in age category between 20- 40 years. Others socio-economic indicators showed that 81 percent had a monthly income below 3000 taka, 47 percent were literates who could read or write their own name and 25 percent were employed in service. Among the female subjects 76 percent were housewives and 19 percent were engaged in job. But most of the males about 68 percent were working in garment industries and or as a daily labor like rickshaw pullers, carpenters and construction workers.

The study revealed that the total prevalence of diabetes in this population were 8.1 percent and female had a higher prevalence rate (8.5%) compared to male (7.7%). The prevalence of diabetes was increased with the increasing of age for both males and females. The females had higher prevalence of diabetes in all age categories compared to males and it was almost two fold higher in age group 41-50 years.

We have observed a higher rate of increment in mean blood glucose among females subjects compared to males according to fasting blood glucose values (FBG). Among the older age group >50 years the male had higher level of mean blood glucose values compared to females, though the differences were not statistically significant. This was probably a consequences of fewer

(1/2) female participants in this age group compared to males. 2-h BG values showed the heightened values, among females at an earlier age compared to males. Poor to moderate agreement were observed between fasting blood glucose and 2-h glucose values on 476 subjects (kappa 0.41, P <0.001). The differences in mean blood glucose values followed by FBG or OGTT may at least in part explain the observed poor agreement.

Prevalence of systolic hypertension (sBP >140 mmHg) and diastolic hypertension (dBP >90 mmHg) were found to be 1.3% and 2.3% respectively. But we did not find any association between systolic and diastolic hypertension among the diabetic subjects following FBG or OGTT. Forty seven percent of our study subjects were literates and the prevalence of diabetes among the literates were found to be 9.5 percent compared to illiterates 6.9 percent ($p<0.05$). Our study subjects appeared to represent a lean population with mean BMI 19.4 and only 6.2 percent were defined as over weight(BMI >25.0). No significant association was observed between BMI and the occurrence of diabetes in our study population. Rather a protective effect was found among the subjects with BMI between 16.0-18.4 compared to normal BMI (18.4-24.9).

The recent WHO report on diabetes prevalence alarmed that diabetes has posed a serious threat to developing countries in respect to their existing health care services. Further, the prevalence of diabetes is predicted to increase dramatically over the next 25 years, mostly as a result of type 2 diabetes. Diabetes mellitus particularly type 2 diabetes is now recognized as a major chronic public health problem of Bangladesh. Some small-scale survey on community level has shown that the prevalence of glucose intolerance and hypertension is high. Diabetes, hyperinsulinemia and coronary risk factors are more prevalent in Bangladeshis compared with other South Asian migrants (Indian, Pakistani) settled in United Kingdom and with the native population. It has been reported that Bangladeshis among all other South Asian immigrants had higher morbidity and mortality from CHD in UK. In recent years the magnitude of diabetes is increasing and an emergent trend of diabetes registration are shown in all referral centers of Bangladesh, and studies have shown that the prevalence is higher in urban population than their rural counterparts.

In the last few decades, the urban population of the developing world has grown rapidly due to migration from rural areas. Bangladesh is no exception to this trend; the population growth rate of urban areas is three times higher (6-7%) than the national population growth 2% per year. According to the recent report, at the current pace of urbanization and territorial extension, Dhaka is expected to become the ninth mega city of the world for population density by the year 2015(12). At present 30 percent of total population of Dhaka city about 3 million are residing in different slums. Urban slum dwellers are exposed to poor environmental settings such as overcrowding, no access of gas and electricity, poor quality of drinking water and sanitation, and no removal of waste. All these factors are likely to contribute for the development of a variety of acute infection to chronic health problems. Some small-scale surveys on the prevalence of diabetes showed that type 2 diabetes is higher in urban areas than the rural and it is increasing. Earlier studies showed that people in transitional stage of urbanization is likely to change their life style resulting in increasing prevalence of diabetes. This phenomenon could be applicable to the most of the rural population of Bangladesh who are in an in-between the stage of urbanization.

But sound comparative studies are almost non-existing in Bangladesh as to show the impact of urbanization on the possible development of diabetes. We have already conducted a study in the rural areas of Gazipur and Tangail district located approximately 35 miles north in Dhaka city in 1999. This study attempts to estimate the prevalence of type 2 diabetes and important risk factors in Bangladeshi urban slum population, further comparison of prevalence's and risk factors were examined with its sources population.

Diabetic retinopathy

Diabetic retinopathy is the most common diabetic eye disease, is caused by complications that occurs when blood vessels in the retina weakens or distracted. It results in loss of vision if early detection is not done. Parthiban et al. Have used Naive bayes and Support Vector Machine to predict the early detection of eye disease diabetic retinopathy and found that Naive bays method to be 83.37% accurate. Pima Indians Diabetes dataset was used for analysis. The main focus was on retinopathy disease prediction.

Diabetic patient's heart diseases

Coronary artery disease (CAD) is an important medical and public health issue because it is common and leading cause of death throughout the world. Cardiovascular disease is a disease which affects the heart and the blood vessel and the manner in which blood is pumped and circulated through the body. Cardiovascular disease (CVD) results death, severe illness and other harms to body. Therefore, Ujma Ansari et al. has provided a predictive model for heart diseases of diabetic patients using data mining techniques. They have done several experiments on the same dataset to compare the performance of predictive data mining technique. They have showed Decision Tree outperforms and some time Bayesian classification was having similar accuracy as of decision tree but other predictive methods like KNN, Neural Networks, Classification based on clustering were not performing well. They have used for dataset 909 records with 15 medical attributes (factors) which were obtained from the Cleveland Heart Disease database. From experimental analysis they have found that Na¨ıve Bayes appeared to be most effective as it had the highest percentage of correct predictions (86.53%) for patients with heart disease, followed by Neural Network (with a difference of less than 1%) and Decision Trees. Decision Trees, however, appeared to be most effective for predicting patients with no heart disease (89%) compared to the other two models.

Significant risk factor for the development of diabetes for men

Age, sex, literacy and waist to-hip-ratio for male were found to be statistically significant risk factors for the development of type 2 diabetes both in vicariate and multivariate analysis controlling for potential confounding factors following both FBG and 2-h BG values. Never the less, the strength of association varied within the limit of statistical significance.

Determinants to differences in Prevalence of type 2 Diabetes

The objective of the study was to investigate the differences in prevalence of type 2 diabetes and associate risk factors in rural compared to urban population. In addition, the diagnostic procedures were examined both among the rural and urban subjects. In this comparative analysis, a total 4757 subjects from rural and 1555 subjects from urban areas >20 years of age were examined. Among the rural subjects 2037 were male, 2720 were female, in urban area 731 were male, and 824 were female. The prevalence of diabetes was found to be higher among the urban subjects 8.1% compared to rural 2.3%. Almost three to five fold higher prevalence was found with increasing age in urban subjects compared to rural.

Females had a higher prevalence of diabetes both in urban and rural compared to males (urban female 8.5% and male 7.7%, rural female 2.5% and male 1.9%) and in all age groups the difference was found statistically significant (P<0.05). The prevalence of DM did not appear to differ in urban or in rural population following either FBG or OGTT procedures for a selected subjects (urban 476 and rural 1046). Equal poor agreement was found between FBG and OGTT for both in urban and rural population (kappa 0.41 in urban and kappa 0.40 in rural).

The differences in mean blood glucose values were fairly similar for both sexes in urban and rural areas following FBG up to the age of 50 across all age groups, but after the age of 50 the mean glucose values for men were found to be higher compared to women despite of equal prevalence of DM among the urban male and female subjects. This may indicate a weakness related to fewer female participants in this age category. In contrast 2-h BG values showed elevated levels of mean BG values among the female participants at an earlier age both in rural and urban population.

Age, sex and waist-to-hip ratio for male were found to be important risk factors for the development of diabetes among urban and for rural population following FBG and OGTT. Systolic hypertension was found to be marginally associated with DM cases in rural population (OR, 2 and 95%CI 1.0-3.9) but this association was not apparent among the urban subjects. No association was observed with BMI and the occurrence of diabetes in our population for the urban or in rural subjects.

We observed a four-fold raise of diabetes in urban population compared to rural in spite of almost similar level of mean BMI (for urban 19.4 and rural 20.2 subjects). However, the risk of diabetes was notably higher for the obese individuals (BMI >30.0) both in rural and urban but the apparent statistical significance was not observed in multivariate analysis because of fewer numbers of subjects belonging to this group (rural 11 and urban 7).

Conversely a protective effect was observed among the urban subjects with BMI 16.0- 18.4 compared to normal BMI 18.5-24.9 (OR, 0.6 and 95% CI 0.3-0.9). Waist to hip ratio (WHR>0.9) for male were found to be a risky state for the development of diabetes both in urban and rural population following FBG and OGTT in multivariate model after adjusting for a number of confounding variables.

Patient's Height: To generate patient's height, normal probability distribution is a suitable one. Let assume, adult male heights are on average 70 inches (5 feet 10 inch) with a standard deviation of 4 inches. Adult women are on average a bit shorter and less variable in height with a mean height of 65 inches (5'5) and standard deviation of 3.5 inches. If we took a large sample of men and woman's heights and graphed the frequency of the heights we'd see something like the following:

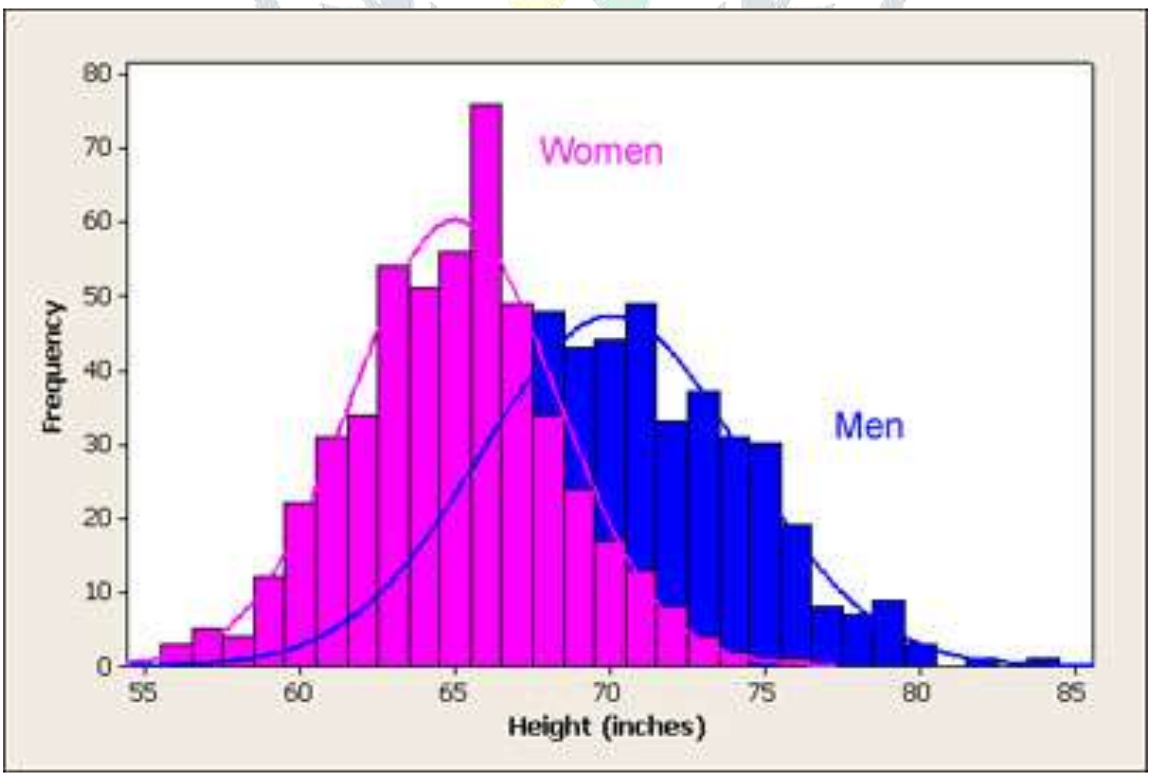

Figure 3.4: Patients' Height

For male, we assume average height as 66 inch (5 Feet 6 inch) and standard deviation from average, will be 4 inch..For female, we assume average Height as 63 inch (5 Feet 3 inch) and standard deviation from average will be 3.5 Inch. After using above stated algorithm we will get random height.

Patient's working type:
Patient's working type can be used to identify his physical ability and calories need. Exercise time should vary with profession of patients. Patient's working type can be divided into four categories:

a) Village at work: The people who live in village but do physical labor comparatively much are in this category. Therefore their calories need is more than other people and they need less exercise as they are involved in physical labor.

b) Village no work: The people who live in village but do physical labor less than other people are in this category. Their calories need should be maintained properly as they do less physical work. They also need to more exercise than normal people.

c) City at Work: The people lives in the city but does more physical work is in this category.

They also need to less exercise.
d) City No Work: The people lives in city but do less work than others.
The following Equation which is called Mifflin-St Jeor equation developed by Mifflin-St Jeor et al. is used in our work to calculate RMR (Resting Metabolic Rate).

RMR (males) = 10 weight (kg) + 6:25 height (cm) □ 5 age (y) + 5 (3.2)
RMR (females) = 10 weight (kg) + 6:25 height (cm) □ 5 age (y) □ 161 (3.3)
Based on working type and Exercise time a factor will be generated. Then the final equation will be:

Calories need = RMR factor: (3.4)
In this way we have generated patient's calories need.

Patient's Blood Sugar: Patient's fasting blood sugar is calculated through normal distribution with the mean =7.5 and =1. Patient's blood sugar after 2 hours of meal is also calculated through normal distribution with the mean =12.5 and =1.
Patient's Blood Pressure: Patient's blood pressure has two parts which are Systolic blood pressure and diastolic blood pressure. Systolic blood pressure has been calculated through normal distribution with the mean=120 and =10 for male and the mean=120 and =15 for female.

If the age of a patient is greater than 60 years then it will be changed as the mean =125 and =10 for male and the mean =135 and=10 for female. Diastolic blood pressure has been calculated factorizing Systolic blood pressure.

CONCLUSION AND RECOMMENDATIONS
The study showed a fourfold higher prevalence of type 2 diabetes among the urban poor migrants compared to its sources population i.e. rural. The findings were consistent with other studies on developing countries. The risk factors identified for the development of type 2 diabetes for urban and rural population are largely the same but the reasons for increased risk for the urban population were not identified in the study. BMI Measures useful to indicate people at risk for the development of type 2 diabetes were not found to be appropriate in our population. This may call for reexamination for BMI categories in different population in order to identify the people at risk for the development of diabetes.

Procedures applied to measure prevalence of diabetes in our lean population did not differ significantly either following FBG or OGTT, rather we could say that FBG did not provide an under estimation of the prevalence of DM compared to OGTT procedure. Suitability of the diagnostic procedures in different population may vary and therefore deserves an examination for its applicability. In general, hard-core poor people migrate from rural to urban slums in search of better life. As poverty and LBW are interlinked entity it may be presumed that LBW babies carry a higher risk of diabetes in adulthood irrespective of their obesity status. Alleviation of poverty may still be the key factor for the prevention of DM in lean population affecting millions of people in the developing world.

Patient's Exercise: Depending on the working type patients are given exercise time which is basically from 70 minutes to 315 minutes in a week.

Patient's Calories need: To make a meal plan for patients we need to calculate their calories need first and to get calories need we need to calculate the Resting Metabolic Rate.

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