SUMMARY
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First stage in the development of type 2 diabetes mellitus is often insulin resistance, requiring increasing amounts of insulin to be produced by the pancreas to control blood glucose levels. Initially, the pancreas responds by producing more insulin, but after several years, insulin production may decrease and diabetes develops. Common symptom of Diabetes mellitus type 2 are feeling very tired, thirsty, or nauseated and have to urinate often, weight loss, blurred vision, frequent infections, and slow healing of wounds or sores. Although some patients of diabetes mellitus type 2 have no symptom at all and some have more than two or three symptom. Because the symptoms are varied it is importance for health care provider or government to identify and test populations who are at high risk for the diseases.

The dynamics of the diabetes epidemic are changing rapidly. Once a disease of the west, type 2 diabetes has now spread to every country in the world, particularly developing country like India. Once “a disease of affluence”, it is now increasingly common among poor. Once an adult-onset disease almost unheard of in children, rising rates of childhood obesity has rendered it more common in the paediatric population.

Type 2 diabetes is a global public health crisis that threatens the economies of all nations, particularly developing country like India. Because of rapid urbanization, nutrition transition and increasingly sedentary lifestyle, the epidemic has grown in parallel with the worldwide rise in obesity. Gujarat’s large population and rapid economic development have made it an epicentre of the epidemic.

Gujarat population tend to develop diabetes at younger ages. Several factors contribute to accelerated diabetes epidemic in Gujarat, including the obesity and decreased physical activity levels. The risk factors for developing diabetes mellitus type 2 are two types: (1) acquired risk factor (2) environmental risk factor. One cannot change acquired risk factor. It includes- Age and Family History. One may change environmental risk factor by their lifestyle. It includes Body mass index (BMI), Central obesity, Insulin Resistance and Metabolic syndrome, Physical Inactivity and Sedentary occupation, Faulty dietary habit, Stress, Urbanisation, Cardiovascular problems and stroke, Gestational Diabetes and Thyroid disorders.
The effects of diabetes mellitus type 2 include retinopathy, neuropathy, nephropathy, foot ulcer and itching skin problem. People with diabetes are at high risk of developing cardiovascular diseases.

The International Diabetes Federation (IDF) estimates the total number of diabetic subjects to be around 40.9 million in India and this is further set to rise to 69.9 million by the year 2025 (Sicree R et al., 2006).

There are several studies from various parts of Gujarat which reveal a rising trend in the prevalence of type-2 diabetes mellitus in the urban areas. There are several studies that show most people have type-2 diabetes mellitus. Among all patients, 90% patients are of type-2 diabetes mellitus. It is quite evident from the above observation that diabetes has become a major health problem in Gujarat in order to assess the magnitude of the problem and its impact on health and economy of the state we must have all information about the prevalence of type-2 Diabetes in Gujarat. But we still have not authorised data about the risk factors of Diabetes in Gujarat. The data on the prevalence of type-2 Diabetes in Gujarat needs to be compiled and analysed. In this study, we try to establish a profile of diabetes’ patients from all the data which we will get during study period. We selected north Gujarat as a study area. The north part of Gujarat is called north Gujarat. It includes Gandhinagar, Banaskantha, Sabarkantha, Mehsana and Patan district.

Samples from above community have been selected using stratified random sampling method numbering 1000 patient of diabetes mellitus type 2. It means 200 patient of diabetes mellitus type 2 from each district.

The patients were interviewed at the time of OPD when they came for routine consultation with doctor. All the persons of more than 20 years of age were interviewed in this study. A valid questionnaire was filled by patient after explaining all important points to them. Researcher selected patients who were early diagnosed as a diabetic patient and interviewed them when they came above places for their routine check up. The interview was conducted by using the pre-designed and pre-tested interview questionnaire which contained information on various study variables.

The major objectives of the present study where as under:-
To study and compare risk factors of diabetes mellitus type 2 with regards to various-age group, BMI, diabetes duration, family history, stress, dietary habit, physical activity, addiction, thyroid disorders, cholesterol level, heart trouble, complications like-retinopathy, nephropathy, neuropathy, foot ulcer, itching skin problem.

1. Among patients of diabetes mellitus type 2 of various districts.
2. Between male and female patients of diabetes mellitus type 2.
3. Between urban and rural area’s diabetes mellitus type 2 patients.
4. Among patients of diabetes mellitus type 2 with different diabetic duration periods.
5. Among patients of diabetes mellitus type 2 suffering from various diabetic complications.
6. Between patients of diabetes mellitus type 2 suffering from coronary heart diseases and without coronary heart disease.
7. Among patients of diabetes mellitus type 2 with addiction or without addiction.
8. Among patients of diabetes mellitus type 2 with high blood pressure and without high blood pressure.
9. Among patients of diabetes mellitus type 2 with stress and without stress.
10. Among patients of diabetes mellitus type 2 with physical activity and without physical activity.
11. Among patients of diabetes mellitus type 2, taking high calorie diet and normal diet.
12. Among patients of diabetes mellitus type 2 with various BMI.
13. Among patients of diabetes mellitus type 2 with various age groups.
THE MAJOR HYPOTHESIS OF THE PRESENT STUDY WHERE AS UNDER:

3 A: - HYPOTHESIS RELATED TO DISTRICTS

H₀ - There will be no significant difference among patients of diabetes mellitus type 2 of various districts with regards to...

1.1 Various risk factors such as - age group, BMI, diabetes duration, family history, stress, dietary habit, physical activity, addiction, HBP thyroid disorders cholesterol level, heart trouble.

1.2 Various complications like - retinopathy, nephropathy, neuropathy, foot ulcer, itching skin problem.

H₁ - The risk factors and complications which affect the numbers of the patients of DMT2 of various districts are age group, diabetes duration, family history, stress, dietary habit, addiction, thyroid disorders, cholesterol level and heart trouble and retinopathy, neuropathy, itching skin problem. The risk factors and complications which not affect the numbers of the patients of DMT2 of various districts are BMI, physical activity and high blood pressure and complications- nephropathy and foot ulcer.

3 B: - HYPOTHESIS RELATED TO URBAN AND RURAL AREA

H₀ - There will be no significant difference between diabetes mellitus type 2 patients of urban and rural area with regards to various risk factors and complication.

H₁ - The risk factors and complications which affect the numbers of the patients of DMT2 of urban and rural area are age group, BMI, diabetes duration, family history, addiction, thyroid disorders, high blood pressure and heart trouble and nephropathy, neuropathy, foot ulcer and itching skin problem. The risk factors and complications which not affect the numbers of the patients of DMT2 of urban and rural area are stress, dietary habit, physical activity and cholesterol level and retinopathy.

3C - HYPOTHESIS RELATED TO GENDER:

H₀ - There will be no significant difference between male and female patients of diabetes mellitus type 2 with regards to various risk factors and complication.
H₁ - The risk factors and complications which affect the numbers of the patients of DMT2 of different gender are risk factors such as stress, diabetic duration, addiction, thyroid disorders, cholesterol level and complications- retinopathy and neuropathy. The risk factors and complications which not affect the numbers of the patients of DMT2 of different gender are- age group, BMI, family history, dietary habit, high blood pressure, physical activity, heart trouble and complications- nephropathy, foot ulcer and itching skin problem.

3D- HYPOTHESIS RELATED TO AGE GROUP

H₀ - There will be no significant difference among patients of diabetes mellitus type 2 with various age groups with regards to various risk factors and complications.

H₁ - The risk factors and complications which affect the numbers of the patients of DMT2 of various age groups are risk factors such as Diabetic duration periods, BMI, family history, high blood pressure, cholesterol level, heart trouble and complications like-retinopathy, nephropathy, neuropathy, foot ulcer, skin itching problem. The risk factors and complications which not affect the numbers of the patients of DMT2 of various age groups are- stress, food habit, addiction, physically active, thyroid abnormality.

3E - HYPOTHESIS RELATED TO BMI

H₀ - There will be no significant difference among patients of diabetes mellitus type 2 with various BMI with regards to various risk factors and complications.

H₁ - The risk factors and complications which affected the numbers of the patients of DMT2 of various BMI are risk factors such as age group, high blood pressure, thyroid disorders, cholesterol level, heart trouble and complications like-nephropathy, neuropathy. It means the risk factors and complications which not affected the numbers of the patients of DMT2 of various BMI are stress, gender distribution, family history, dietary habit, physical activity, addiction, diabetic duration periods and complications-retinopathy, foot ulcer and itching skin problem.

3F- HYPOTHESIS RELATED TO FAMILY HISTORY

H₀ - There will be no significant difference among patients of diabetes mellitus type 2 with various family history with regards to various risk factors and complications.
H₁ - The risk factors and complication which affected the numbers of the patients of DMT2 of different family history are age group, diabetic duration periods, stress and thyroid disorders and complications like- neuropathy. It means the risk factors and complication which affected the numbers of the patients of DMT2 of different family history are BMI, gender distribution, dietary habit, physical activity, addiction, high blood pressure, cholesterol level, heart trouble and complications-retinopathy, nephropathy, foot ulcer and itching skin problem.

3G-HYPOTHESIS RELATED TO DIABETES DURATION PERIODS

H₀ - There will be no significant difference among patients of diabetes mellitus type 2 with different diabetic duration periods with regards to various risk factors and complications.

H₁ - The risk factor and complications which affected the numbers of the patients of DMT2 of various diabetic duration periods are age group, BMI, high blood pressure, heart trouble And complications like-retinopathy, nephropathy, neuropathy, foot ulcer, itching skin problem. The risk factor and complications which not affected the numbers of the patients of DMT2 of various diabetic duration periods are - stress, gender distribution, family history, dietary habit, physical activity, addiction, thyroid disorders, cholesterol level.

3H-HYPOTHESIS RELATED TO HEART TROUBLE

H₀ - There will be no significant difference between patients of diabetes mellitus type 2 suffering from coronary heart diseases and without coronary heart diseases with regards to various risk factors and complications.

H₁ - The risk factors and complications which affected the numbers of the patients of DMT2 of various coronary heart diseases are age group, diabetic duration periods, physical activity, addiction, high blood pressure, cholesterol level, heart trouble and complications like- retinopathy, nephropathy, neuropathy, foot ulcer, itching skin problem. It means the risk factors and complications which not affected the numbers of the patients of DMT2 of various districts are stress, gender distribution, BMI, family history, dietary habit, thyroid disorders.
3I-HYPOTHESIS RELATED TO STRESS

H₀ - There will be no significant difference between patients of diabetes mellitus type 2 with stress and without stress with regards to various risk factors and complications.

H₁ - The risk factor and complication which affected the numbers of the patients of DMT2 of stress are gender distribution, family history. It means the risk factor and complication which affected the numbers of the patients of DMT2 of stress are age group, BMI, stress, diabetic duration periods, dietary habit, physical activity, addiction, high blood pressure, thyroid disorders, cholesterol level, heart trouble and complications - retinopathy, nephropathy, neuropathy, foot ulcer and itching skin problem.

3J-HYPOTHESIS RELATED TO HIGH BLOOD PRESSURE

H₀ - There will be no significant difference between patients of diabetes mellitus type 2 with high blood pressure and without high blood pressure with regards to various risk factors and complications.

H₁ - The risk factor and complications which affected the numbers of the patients of DMT2 of high blood pressure are age group, BMI, diabetic duration periods, physical activity, stress, cholesterol level, heart trouble and complications like retinopathy, nephropathy, neuropathy. It means the risk factor and complications which not affected the numbers of the patients of DMT2 of high blood pressure are - gender distribution, family history, dietary habit, addiction, thyroid disorders and complications - foot ulcer and itching skin problem.

3K-HYPOTHESES RELATED TO DIETARY HABIT

H₀ - There will be no significant difference between patients of diabetes mellitus type 2, taking high calorie diet and normal diet with regards to various risk factors and complications.

H₁ - The risk factor and complications which affected the numbers of the patients of DMT2 of various dietary habit are cholesterol level, itching skin problem. It means the risk factor and complications which affected the numbers of the patients of DMT2 of various dietary habit are age group, BMI, diabetes duration, family history, stress,
physical activity, high blood pressure, addiction, thyroid disorders, heart trouble and various complications like retinopathy, nephropathy, neuropathy, foot ulcer.

3L- HYPOTHESIS RELATED TO PHYSICAL ACTIVITY

$H_0$ - There will be no significant difference between patients of diabetes mellitus type 2 with physical activity and without physical activity with regards to various risk factors and complications.

$H_1$ - The risk factor and complications which affected the numbers of the patients of DMT2 of physical activity are BMI, diabetes duration, dietary habit, cholesterol level, high blood pressure, heart trouble and nephropathy. It means the risk factor and complications which affected the numbers of the patients of DMT2 of physical activity are age group, family history, stress, addiction, thyroid disorders and various complications like retinopathy, neuropathy, foot ulcer, itching skin problem.

3M- HYPOTHESES RELATED TO VARIOUS COMPLICATIONS

$H_0$ - There will be no significant difference among patients of diabetes mellitus type 2 suffering from various diabetic complications with regards to various risk factors.

$H_1$ - There is significant difference between the numbers of the patients of DMT2 of various complications with regards to risk factors such as age group, diabetic duration periods, physical activity, high blood pressure, stress, cholesterol level, heart trouble.
It means there is no significant difference between the numbers of the patients of DMT2 of various complications with regards to risk factors.

- Out of 1000 patients, 58% male patients and 42% female patients found. In urban area, 57.6% patients are male and 42.4% patients are female. Same results obtain in the rural area. Most of the population based studies reported there was no influence of gender in the prevalence DMT2. Out of 500 patients in urban area 295 patients are male and 205 patients are female and out of 500 patients in rural area 315 patients are male and 185 patients are female. Highest number of male patients in urban area is of Banaskantha district and in rural area is of Mehsana district.

- Mean age of male population is 46.45±10.97 while mean age of female population is 45.65±10.55 which is low in compare to male. Mean age of rural population is 46.73±11.80 while mean age of urban population is 47.16±10.85 which is high in compare to rural population. We seem to have a most of the diabetes cases starting at a 45-65 years. It is therefore absolutely necessary that we can change an age pattern and increase longevity together with rapidly changing lifestyle. High prevalence of DMT2 is in the 51-60 age groups. The prevalence of 51-60 age group was 36% in whole population, 34.4% in rural population, 34.8% in urban population, 36.5% in total male population, 35.23% in total female population, 30.5% in Mehsana district, 33% in Sabarkantha district, 44% in Banaskantha district, 36% in Gandhinagar district and 34.4% in Patan district.

- Maximum patients are between 1 to 5 years, 6 to 10 years and 11 to 15 years diabetic duration periods.

- Maximum numbers of patients have BMI between 18.5 to 25 which is representing normal BMI not overweight. 445 patients are having BMI between 18.5 to 25 which is normal BMI. 592 patients are having BMI greater than 25 so they are overweight and obese. Mean BMI of total population of north Gujarat was 25.84±4.60. Mean BMI of rural population was 24.85±4.81 and of urban population was 27.53±5.89. Urban population have more BMI in compare to rural population. Mean BMI of male was 26.07±4.47 and female was 27.01±5.50. Female are more obese than male. Mean BMI of total population of the Mehsana district was 24.80±4.26, Banaskantha district was 25.93±4.09, Gandhinagar district was 26.01±5.01, Patan district was 25.91±4.36, Sabarkantha district was
26.43±5.58 Guajarati population have a unique body phenotype with lower body mass index, but increase abdominal obesity. Particularly abdominal obesity plays a major role in increase susceptibility to diabetes mellitus type 2.

- People with positive family history are more than people without any diabetic family history. 652 patients have positive family history of DMT2. Total population FH+ was 64.9% and FH− 35.1%, Total male population FH+ was 62.58% and FH− 37.58%, Total female population FH+ was 68.33% and FH− 31.66%, rural population FH+ was 62.4% and FH− 37.6%, urban population FH+ was 68% and FH− 32% The risk for type 2 diabetes in relatives to be approximately 3-4 times higher than in those without a family history of diabetes and they also tend to develop diabetes earlier.

- Prevalence of chronic complications of diabetes has been estimated in this study. Patients with retinopathy are 475, neuropathy-467, nephropathy-399, foot ulcer-289, skin itching-496. The high figures of retinopathy are mainly due to lack of awareness and regular screening especially in cities and rural areas. As vision impairment occurs rather late after the initiation of retinal changes, the diabetic subjects also do not appreciate the due importance of an early periodic eye examination.

- Neuropathy is often ignored due to the insidious onset and slow progress. Although neuropathy can affect every system in the body, the most common manifestation is sensation loss in the feet. Despite absence of symptoms, the feet of a DMT2 patient are at a high risk for ulcers and amputations.

- Nephropathy is a serious complication is not only preventable but reversible if detected in the very early stage. Kidney infection was the leading cause for end stage renal disease. The incidence of diabetes nephropathy is on the rise due to an increase in incidence if diabetes in Gujarat as well as India. Other cause of nephropathy is due to lack of proper screening facility as well as laziness or unawareness of DMT2 patients.

- 286 diabetic patients have heart trouble. Cardiovascular disease and DMT2 both are risk factor of each other. Some patients develop cardiovascular disease first and then detect DMT2 and some patients develop DMT2 first and then have complication of cardiovascular disease. The risk factors for both DMT2 and cardiovascular disease are abdominal obesity, hyperglycaemia, abnormal cholesterol level and hypertension. We can see some differences in socioeconomic
status between big cities like Ahmedabad, Rajkot and Surat and small cities like Mehsana, Patan, Sabarkantha, Banaskantha and Gandhinagar. Most of the people of big cities were more likely to have higher awareness of cardiovascular diseases and diabetic risk factor especially relation to diet, physical activity and regular check up in compare to small cities.

- 97 patients from urban area and 192 patients from rural area have foot infections. Diabetic foot infections are a common in rural patients because they have habit of barefoot walking. Mostly older patients have sensory loss so therefore be considered at risk of intensive foot injury. Because of the loss of sensation caused by neuropathy, sores or injuries to the feet may become ulcerated. Out of total 287 patients of foot ulcer, 217 patients have age more than 50 years. The most challenging patients are those who develop sensory loss with no symptoms, which are difficult to convince that they are at the risk of foot ulcer and are consequently difficult to motivate regarding regular foot self care.

- High number of physically inactive patients are present than physically active. 174 patients from urban area and 203 patients from rural area are physically active. Exercise has many benefits and this study show that regular physical activity improves quality of life from psychological to physical with weight stability and reduces the risk of mortality from all causes.

- Rural patients have more addiction and stress while urban patients have more HBP and heart trouble. 152 patients from urban area and 239 patients from rural area have addiction like tobacco, smoking and alcohol. This study suggested that in males, addictions were significantly related to HBP. In female low income, unsatisfaction, social tension, menopauses were significant predictors of HBP follow by DMT2 and CHD.

- 248 patients from urban area and 197 patients from rural area have high blood pressure. Behavioural factors like addictions, stress, hopelessness and depression are associated with HBP.

- Diabetes mellitus type 2 is distributed across the north Gujarat among all ethnic and socioeconomic groups. The lowest prevalence of DMT2 is in the truly rural low socioeconomic, labour intensive group. Occurrence of diabetes in this community was confined to the over 50 year age group with hardly any relationship to obesity. In urban and rural area have no major difference in the number of diabetic patients.
Maximum prevalence is in 51-60 age groups in both area, there is also decrease in the age of onset, which does not augur well for the community. There is also estimate of undiagnosed patients is highest in the rural population as per my opinions. It is advisable to start screening the population very early in life.

Present health care delivery system in most cities of north Gujarat is not planned to provide the optimal array of services necessary to manage complex, multisystem chronic illness like diabetes. Because of limited availability of trained diabetes health care personnel, even in area with adequate health service, diabetes education and counselling is not available to patients.

As per my opinions, Barriers of in the prevention and care of DMT2 is self blood glucose monitoring is expensive and not easily available, therefore not affordable by majority of the patients. Because of high illiteracy rate, lack of awareness about diabetes and do not understand importance of diet and exercise in life patients suffer much have more complications and spend much money as well as time.

Following measures are suggested to help to combat these problems:-

- Make affordable self glucose monitoring kit.
- Encourage research in basic clinical and social aspects of diabetes.
- Education of the people, their friend, relative with diabetes.
- Use the print and electronic media to educate and create awareness in public about diabetes.

Community based strategy for prevention of diabetes in north Gujarat:-

In this community –based study carried by me in north Gujarat, showed that the awareness of diabetes is very low. Some DMT2 patients were not even aware of a condition called diabetes and knowledge about complications of diabetes was even worse. Those who are educated patients they have knowledge about DMT2 and complications. But they never believe that their conditions become worse due to complication. They always have a feelings that “my diabetes is in controlled conditions” even though they have more than one complication. First reason for rising DMT2 is knowledge and awareness about diabetes and its complications was poor and less than 50% only knew that the disease is preventable.
Modifiable risk factors – dietary habits and physical activity

There are significant changes in the diet and activity patterns of the community which are the important elements in the rising levels of diabetes. There should be strategies to reduce diabetes risk and improve community nutrition level. Government should encourage grains, fibres fruit vegetable by reducing their price and rise tax on processed food and restaurants.

A physical activity is an effective tool in diabetes care without spent any money. The doctors or health professions should highlight the importance of physical activity during leisure time and include physical exercise in to daily routine in the treatment and prevention of DMT2. In order to reduce the prevalence of obesity, patient should be correct their caloric intake, increase physical activity, and decrease the use of vehicles, avoid sedentary occupations, reduce to watching televisions and avoids computer technology and mobile social networking which encourage more hours of sitting rather than standing and walking.

Diabetes mellitus type 2 usually progresses from impaired glucose tolerance (IGT) or pre-diabetic stage to an early asymptotic stage to onset of clinical diabetes and then to the stage of complications.

As flow chart shows if the patients is at pre-diabetic stage and he/she controlled weight ,diet and increase exercise than he/she may able to reduce progression of developing DMT2 or able to keep normal glucose levels. This can be apply to a individual with a family history of diabetes, ageing individuals, sedentary individuals and a large obese proportion of the populations. In clinical diabetes stage also, he
she can reverse this stage and delaying next stage which is complication stage by controlled weight diet and increasing exercise in diabetes. Diabetes can develop slowly, serious complications after some year of development of DMT2. So it is important to detect the disease early by screening in order to prevent or delay damage to heart, kidney, nerves and eyes. To slow down the rate of progression of complications, blood glucose testing of the community should be start at large scale by government or private health organisations.

Nearly the entire populations of Gujarat can be considered at high risk of DMT2. The likely global benefits of weight reductions and increase physical activity, not only proposed for benefits of diabetes of, but also CHD and hypertensions.

In Gujarat there is lack of programme in preventions of DMT2. We should conducting exhibitions which carry message regarding diabetes right down to mass. Low cost educations material including pamphlets, poster, booklets flash cards and CDs on diabetes have been developed in both English and the Guajarati are distribute to the community free of cost.