

Prevalence of Diabetes and Associated Risk Factors among Selected Type 2 Diabetes

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Abstract: *The present study is focused to find out the prevalence of diabetics and associated risk factors among the selected type 2 diabetics. Two of the private and government hospitals having diabetology department at Thiruchirappalli district were selected by purposive method. A total of 1000 diabetic adults comprising 486 males and 335 females in the age group of 20 to 60 years and above who visited the hospitals were selected. The study revealed that 75% of each male and female belonged to the age group of 40-60 years, in which 83% and 81% of male and female had type 2 diabetes respectively. The age of onset of diabetes was between 45- 55 years among 53.7% male and 54.3% female. Only 23.3% of male and 4.3% of females type 2 diabetics had the habit of walking as exercise for a period of 30 minutes per day and 78.6% and 68.4% of male and female type 2 diabetics had disturbed sleep of 5-6 hours. The mean body mass index of male and female type 2 diabetics was 26.73 kg/m² and 26.01Kg/m², categorized under grade I obesity. The mean waist circumference of selected type 2 diabetic male and female subjects was 95.96cm and 93.73cm respectively which were found to be higher than the standard value. The mean waist hip ratio of type 2 diabetic adult women subjects was found to be higher than standard value (>0.8). A strong familial history of diabetes in both parents was observed. Regular medication was noted among 66.9% of male and 61.5% of female subjects. Majority of the diabetic subjects used allopathic drugs like metformin and glimzibide to control diabetes. Blood glucose level was monitored by 41.5% and 54.6% of male and female diabetics respectively only when complications arise. Hence the present study clearly indicates that prompt treatment of the subjects through their life style modification is in timely need.*

Keywords: Prevalence, type 2 diabetics, obesity, physical activity, anthropometric parameter

1. Introduction

The prevalence of diabetes is rapidly rising all over the globe at an alarming rate [1]. Over the past 30 years, the status of diabetes has changes from being considered as a mild disorder of the elderly to one of the major causes of morbidity and mortality affecting the youth and middle aged people. It is important to note that the rise in prevalence is seen in all six inhabited continents of the globe [2]. Although there is an increase in the prevalence of type I diabetes also, the majority driver of the epidemic is the more common form of diabetes, namely type 2 diabetes, which accounts for more than 90 percent of all diabetes cases.

Diabetes is a chronic disease marked by higher level of blood glucose from defects in insulin protection, insulin action or both. India has the maximum number of diabetic patient in the world and this had given the country the dubious distinction of being the "Diabetic capital" of the world. Diabetes mellitus with its devastating consequences has assumed epidemic proportions as its prevalence rising consequences has assumed epidemic proportions as its prevalence is on a rise globally. By 2030 these would be 366 million diabetic throughout the world and 79.44 million diabetics in India alone. WHO projects that deaths due to diabetes will double between 2005 and 2030.

Increasing incidence of diabetes mellitus is mainly due to modern life style and changed diets with balance tilted towards refined foods especially sugar and fat. In people with strong genetic factor, environmental factors such as excessive intake of food especially sugar, obesity and lack of exercise act as precipitating agents.

The marked increase in the prevalence of overweight and obesity was responsible for the recent increase in the prevalence of Non-insulin dependent diabetes mellitus [3]. Inactivity and alcohol consumption are other dominant risk factors for development of type 2 diabetes.

Type 2 diabetes, formerly known as non-insulin-dependent diabetes (NIDDM), accounts for most cases of diabetes mellitus worldwide. It is estimated that in 2000 there were approximately 150 million individuals with the disease and that this number is likely to double by 2025[4]. Dramatic changes in the prevalence or incidence of type 2 diabetes have been observed in communities where there have been major changes in the type of diet consumed, from a traditional indigenous diet to a typical 'Western' diet. Changing disease rates are almost certainly explained by changes in several dietary factors as well as by changes in other lifestyle related factors, notably a reduction in physical activity. Hence the present study was undertaken to incident the prevalence of diabetes based on the age and associated risk factor among the selected type 2 diabetes.

2. Materials and Methods

Two of the hospitals both government and private having diabetology department situated in Thiruchirappalli district were selected by purposive sampling method. A total of 1000 diabetic adults comprising 700 from private and 300 from government hospitals in the age group of 20 to 60 years and above who visited the hospitals over a period of one year were identified. Among them 821 subjects with type 2 diabetes consisting 486 male and 335 females were selected to undertake the present study. A well formulated interview schedule was used to elicit the information pertaining to socioeconomic background, life style and

activity pattern, age at onset of disease, common symptoms experienced, family history of diabetes and medication, anthropometric measurements and dietary pattern of the selected type 2 diabetics. The data were recorded after receiving the written consent form from the selected adult diabetic subjects

Activity pattern of the subjects was recorded from their daily routine, and their involvement in other activities like time spent in recreational activities, type of job, working hours, duration of sleep and kind of physical exercise.

Anthropometric measurements such as weight and height, waist and hip circumference were measured for all the selected type 2 diabetics by using spring flat weighing machine (Bath room scale) and height by using nonstretchable measuring tape respectively.

Body mass index (BMI) was calculated for each from the weight and height values by the following formula- $BMI = \frac{\text{Weight in kg}}{\text{height in meter}^2}$. The waist circumference was measured in a horizontal plane, mid way between the inferior margin of the rib and superior border of the iliac crest [5]. The hip circumference was measured at the level of the greater trochanters, with the legs being held close together. Waist hip ratio (WHR) is calculated by dividing the waist circumference and the hip circumference.

$$\text{Waist-hip ratio} = \frac{\text{Waist circumference (cm)}}{\text{Hip circumference (cm)}}$$

Analysis of Data

Statistical analysis of the data was performed using the SPSS package 16.0 version. The chi-square test was used for comparison of categorical variables and the significance was noted.

3. Results and Discussion

Table-1 reveal that Equinumber of adult male and female subjects were in the age group of 41 to 60 years, followed by this 16.9% of adult male and 17.9% of adult female subjects were in the age group of 20-40 years. Rest of the subjects was in the age group of 60 and above. **Ramachandran et al.**[6] reported that the prevalence of diabetes seems to be more or less the same in both genders.

Table 1: N = 1000, Percent distribution of diabetics based on age

| Age in years | Male | | Female | |
|--------------|------|------|--------|------|
| | No | % | No | % |
| 20-40 | 99 | 16.9 | 80 | 19.3 |
| 41-60 | 439 | 74.9 | 310 | 74.7 |
| 60 and above | 48 | 8.2 | 25 | 6.0 |
| Total | 585 | 100 | 415 | 100 |

The **Figure-1** shows the type of diabetes among the selected diabetes. Out of 1000 adult diabetic subjects, equinumber of adult men (83.1%) and adult women (80.7%) subjects were had type 2 diabetes and rest had type I diabetes. **WHO** [7] reported that the most dramatic increase in type 2 diabetes are occurring in societies in which there have been major changes in the type of diet consumed, reductions in physical activity and increases in overweight and obesity rates.

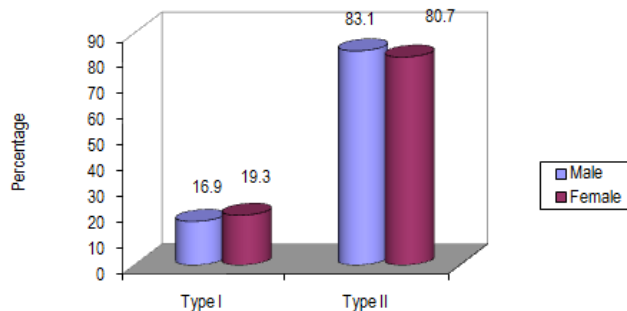


Figure 1: Distribution of Adult subjects based on types of diabetes

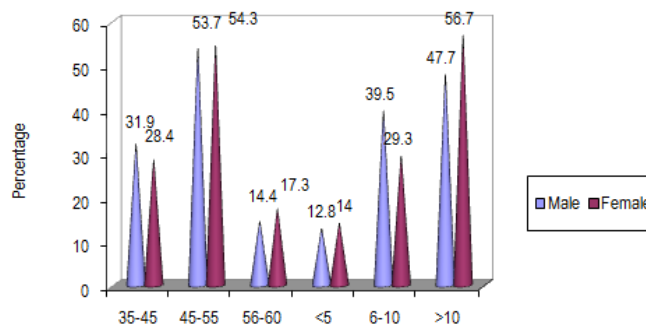


Figure 2: Age at onset and duration of type 2 diabetes N= 821

The background information of the subjects revealed that the number of diabetic subjects increased with increase in age. It is proved from the **Figure- 2** that in the age group of 45 and 55 years, maximum of 53.7% and 54.3% of male and female were affected. Whereas in the age group of 35-45 years the onset of diabetes was noted only among 31.1% males and 28.4 % females. Similarly **Anand et al.** [8] stated that as age increases the rate of diabetes also at upper scale.

It is observed from the present study that 47.7 % of male and 56.7% of female subjects were under the long run of type 2 diabetes for more than 10 years. Next to this, 39.5% of male and 29.3% of female had type 2 diabetes for 6-10 years. Rest of them was affected for less than 5 years. Studies by **Mohan et al** [9] stated that diabetes control in individuals is worsened with longer duration of the disease (9.9±5.5 years).

Table 2: Type and frequency of exercise pattern
N = 821

| Nature of exercise | Male | | | | | | Female | | | | | |
|--------------------|-------------|-------|-----|-------------|-------|------|-------------|-------|------|-------------|-------|-----|
| | 15 min/ day | | % | 30min / day | | % | 15 min/ day | | % | 30min / day | | % |
| | Once | Twice | | Once | Twice | | Once | Twice | | Once | Twice | |
| Walking | - | - | - | 113 | - | 23.3 | 12 | - | 3.6 | 13 | - | 3.9 |
| Yoga | - | 40 | 8.2 | - | 27 | 5.6 | - | 60 | 17.9 | - | - | - |
| Cycling | 12 | - | 2.5 | - | - | - | - | - | - | - | - | - |

From the study it is clear that two fifth of male and one fourth of female subjects had a regular habit of doing exercise such as walking, yoga and cycling. The frequency of practicing exercise is shown in **Table -2**. Among the selected 821 adult type 2 diabetic subjects, only 39.6% of male and 25.4% of female subjects followed exercise on regular basis, in which only 23.3% of male and 3.9% of female subjects were having the habit of walking as exercise for a period of 30 minutes per day. Only 8.2% of male and 17.9% of female subjects practiced yoga for 15 minutes twice a day.

Regular exercise can increase the sensitivity of the body tissues to insulin by more than 30 percent. Many studies suggest that walking briskly for a half an hour every day reduces the risk of developing type 2 diabetes by 30 percent. Physical activity helps to correct the associated lipid abnormalities, increases cardiovascular fitness as well [10].

Table 3: Sleeping Pattern of the Selected Type 2 Diabetes
N= 821

| Sleep pattern | Male | | Female | |
|--------------------------|------|------|--------|------|
| | No | % | No | % |
| Disturbed sleep (5-6hrs) | 382 | 78.6 | 229 | 68.4 |
| Sound sleep (7-8 hrs) | 104 | 21.4 | 106 | 31.6 |

The subjects had either disturbed or sound sleep and the details are depicted in **Table – 3**. The information related to sleep patterns of the selected type 2 diabetic subjects shows that majority of male (78.6%) and female (68.4%) subjects had disturbed sleep for 5-6 hours. Only 21.4 percent of male and 31.6 percent of female subjects had sound sleep for 7-8 hours a day. The present study coincides with the study reported by **Dhindsa [11]** who stated that only 33.3 percent diabetic subjects had sound sleep for 7-8 hours.

The mean anthropometric parameters of the selected type 2 diabetic subjects are presented in **Table- 4**. This includes height, weight, body mass index (BMI), waist circumference, hip circumference and waist hip ratio of the adult subjects at the time of the survey.

Table 4: Anthropometric Parameters of the Selected Type 2 Diabetes
N=821

| Variable | Male | Standard value | Female | Standard value | P= value |
|-------------------------------------|---------------|----------------|---------------|----------------|----------------------|
| Height in cm | 166.39 ± 6.53 | - | 159.93 ± 8.09 | - | <0.0001 ^s |
| Weight in kg | 74.03 ± 8.19 | 60 | 66.95 ± 5.72 | 55 | <0.0001 ^s |
| Body mass index(kg/m ²) | 26.73 ± 2.12 | 18.5-22.99 | 26.01 ± 2.10 | 18.5-22.99 | <0.0001 ^s |
| Waist circumference in cm | 95.96 ± 2.30 | ≥94.0 | 93.73 ± 2.99 | ≥80 | <0.0001 ^s |
| Hip circumference in cm | 103.59 ± 2.16 | - | 114.40 ± 4.48 | - | - |
| Waist hip ratio | 0.92±0.03 | <1.0 | 0.81 ± 0.04 | <0.8 | <0.0001 ^s |

*Significant associated at 0.0001% level

The mean height of male and female subjects was 166.39 ± 6.53 cm and 159.93 ± 8.09 cm. The mean weight of male was 74.03 kg and the female was 66.9kg which exceeded the weight of reference man (60kg) and women (55kg) [12].

The mean BMI of the male and female type 2 diabetic subjects were 26.73± 2.12 and 26.01± 2.10 respectively which were higher than the desired level of 18.5-22.99.

Regarding the mean waist circumference of male and female subjects were 95.96±2.30 and 93.73±2.99 which was found to be higher than the standard value. The mean hip circumference of male and female subjects was 103.59±2.16 and 114.56±4.48. The mean WHR value of 0.92 ± 0.03 was at desirable level. But the WHR of female

was more than 0.8 which indicate the risk of obesity related complications. Asian Indians tend to have greater waist circumference and waist to hip ratios [13] thus having a greater degree of central obesity. The mean difference of height, weight, body mass index, and waist circumference and waist hip ratio was statistically analyzed using chi square test. The obtained p value is highly significant at 0.001% level

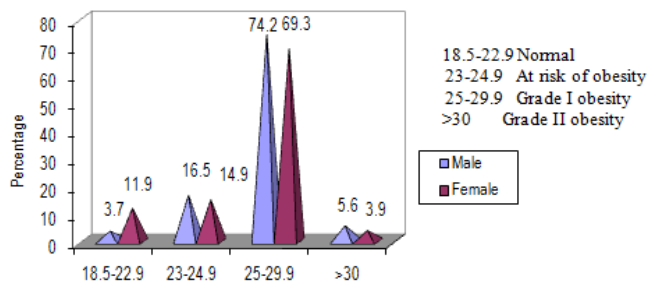


Figure 3: Distribution of Type 2 Diabetic Subjects According to Grade of Obesity
N= 821

Source: Adapted from WHO, 1995[14] , WHO, 2000 [15] and WHO 2004 [7].

An analysis of body mass index of the selected type 2 diabetic subjects based on Asian Indian classification was reported in **Figure 3**. Majority of male (74.2%) and female (69.3%) subjects were categorized under grade I obesity with the body mass index greater than normal value between 25-29.9 kg/m². Next to this 16.5% of male and 14.9% of female subjects were at risk of obesity. Grade II obesity was identified among 5.6% of male and 3.9% of female subjects. Normal BMI was maintained by 3.7% and 11.9% of male and female subjects. **Vikaram et al.[16]** inferred that study conducted in north India indicated that there was a strikingly high prevalence of abdominal obesity and generalized obesity as determined by body fat percentage in type 2 diabetes individuals.

Table 5: Symptoms of diabetes among the selected type 2 diabetics
N= 821

| Symptoms | Male | | Female | |
|--------------------|------|------|--------|------|
| | No | % | No | % |
| Polyuria | 215 | 44.2 | 189 | 56.4 |
| Polydypsia | 96 | 19.8 | 75 | 22.4 |
| Polyphagia | 85 | 17.5 | 63 | 18.8 |
| Delayed healing | 79 | 16.3 | 38 | 11.3 |
| Nocturia | 125 | 25.7 | 45 | 13.4 |
| Loss of weight | 25 | 5.1 | 30 | 8.9 |
| Itching | 52 | 10.7 | 102 | 30.4 |
| Tiredness | 305 | 62.8 | 178 | 53.1 |
| Excessive sweating | 113 | 23.3 | 204 | 60.9 |

Multiple Responses

The symptoms that were reported by the type 2 diabetics are presented in **Table-5**.The most common symptoms observed in male type 2 diabetic subjects were tiredness (62.3%), polyuria (44.2%), Nocturia (25.7%), excessive sweating (23.3%) and in female type 2 diabetic subjects were excessive sweating (60.9%), polyuria (56.4%), tiredness (53.1%), itching (30.4%) and Polydypsia (22.4%) was commonly observed. These results indicate that male and female subjects experienced multiple symptoms at the time of study.

Table 6: Family history of the selected type 2 diabetes
N=821

| Family history | Male | | Female | |
|-----------------------|------|------|--------|------|
| | No. | % | No. | % |
| Diabetic father | 55 | 11.3 | 34 | 10.1 |
| Diabetic mother | 46 | 9.5 | 61 | 18.2 |
| Both parents | 285 | 58.6 | 210 | 62.7 |
| Siblings | 65 | 13.4 | 12 | 3.6 |
| Maternal grand parent | 15 | 3.1 | 6 | 1.8 |
| Paternal grand parent | 20 | 4.1 | 12 | 3.6 |
| Total | 486 | 100 | 335 | 100 |

Table 6 reveals the familial history of diabetes among the selected type 2 diabetes. Majority of male (58.6%) and female (62.7%) subjects had a family history of diabetes in both parents. Next to this 11.3% and 10.1% of male and female subjects had inherited diabetes from father and 9.5% of male and 13.0% of female subjects were from mother. On analysis highly significant association was found between family histories of diabetes and type 2 diabetes mellitus. **Ravi Kumar et al. [17]** have also reported a significant association of diabetes with family history in their study.

Table 7: Regular medication pattern among selected type 2 diabetes
N=821

| Regular medication pattern | Male | | Female | |
|----------------------------|------|------|--------|------|
| | No. | % | No. | % |
| Regular | 325 | 66.9 | 180 | 53.7 |
| Not regular | 161 | 33.1 | 155 | 46.3 |
| Total | 486 | 100 | 335 | 100 |

Table-7 shows the regular medication pattern of selected type 2 diabetes. It was found that majority of male (66.9%) and female subjects (61.5%) were on regular medication, which is essential to control diabetes. Rest of the subjects was not on regular medication.

Table 8: Type of Treatment Undergone by the Selected Type 2 Diabetes
N=821

| Treatment undergone | Male | | Female | |
|--------------------------|------|------|--------|------|
| | No. | % | No. | % |
| Allopathic drug +Insulin | 180 | 37.0 | 124 | 37.0 |
| Allopathic drug + diet | 290 | 59.7 | 202 | 60.3 |
| Ayurvedic drug | 6 | 1.2 | - | - |
| Homeopathic drug | 10 | 2.1 | 9 | 2.7 |
| Total | 486 | 100 | 335 | 100 |

The type of medication used by the selected type 2 diabetes is presented in **Table – 8**. Majority of the diabetic subjects used allopathic drugs like metformin and glimzibide to control diabetes. Next to this 31% of male and female subjects used allopathic drug and insulin to control diabetes. Medications are used to reduce blood glucose with the expectation that this might improve clinical complications.

Table 9: Distribution of selected type 2 diabetes based on checking the blood and urinary glucose levels

N=821

| Checking of blood and urinary glucose | Male | | Female | |
|---------------------------------------|------|------|--------|------|
| | No | % | No | % |
| When complication arise | 112 | 23.0 | 130 | 38.8 |
| Monthly once | 98 | 20.2 | 65 | 19.4 |
| Once in two months | 227 | 46.7 | 125 | 37.3 |
| Yearly once | 49 | 10.1 | 15 | 4.5 |
| Total | 486 | 100 | 335 | 100 |

Table- 9 shows the monitoring pattern of checking their blood and urinary glucose level. Only when the complications arise, 41.5% and 54.6% of male and female subjects checked their blood glucose level. Next to this 28.2% of male and 31.3% of female subjects checked their blood glucose level once in two months.

4. Conclusion

The study on prevalence of diabetes exposed that majority of male and female subjects had type 2 diabetes in the age group between 40 and 60 years. The associated risk factors showed that majority of adult subjects had no habit of doing physical activity on regular basis and there is marked increase in prevalence of overweight and obesity was seen in majority of the selected type 2 diabetic subjects. The mean waist circumference of the male and female type 2 diabetic subjects was found to be higher than the normal range. The mean waist hip ratio of adult women type 2 diabetic subjects was found to be higher than the desirable value. Based on the disease condition majority of type 2 diabetic adults experienced multiple symptoms and they were under longer run of diabetes which worsens the control of diabetes in normal range. There is a significant association of diabetes with family history of both the parent. Some of the type 2 diabetic adult subjects monitor their blood and urine glucose only when the complications arise, this shows that they were under poor glycemic control which give rise to many diabetic complications which can be life threatening. Hence the present study clearly indicates that prompt treatment of the subjects through their life style modification is in timely need.

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