

# Body Mass Index, Stress and Hyperglycaemia Amongst Diabetics in Southern Punjab

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**Objective:** To assess the effect of Body Mass Index and stress on control of blood sugar levels in type II diabetic patients in a teaching hospital of Lahore. It was a cross-sectional study, hospital based, on known diabetic patients who reported in out patient department, Mayo Hospital, Lahore, known type II diabetics who were already on anti-diabetic treatment were studied for BMI, stress and blood sugar levels. **Results:** 62 patients were studied, out of these 40 were females and 22 were males, almost the ratio of 2:1. Age range was 32-72 years with the mean of  $50.87 \pm 7.86$ , duration of DM was in the range of 1-17 years with the mean of  $6.61 \pm 3.89$ , Random blood sugar was in the range of 133-410 mg% with the mean of  $234.55 \pm 72.68$ . 6(9.67%) patients, 2 male and 4 females had BMI of 20, 20(32.27%) had BMI of 20-24.9 which is categorized as within normal units, 30(48.39%) patients had BMI of 25-29 which is overweight and 6(9.67%) had BMI of 30-39.9 which is obese. All these patients were taking oral hypoglycaemic drugs, 20(32.27%) were on single drug, 36(59.06%) were on combination of two drugs and 6 (9.67%) were combination of three drugs. Stresses were analysed, 22(35.48%) had a single cause of stress, 30(48.39%) had 2 causes of stress & 10(16.13%) had more than two causes of stress.

**Key Words:** Diabetes Mellitus (DM), Body Mass Index (BMI), Stress, Stress Management Diabetic Care, Diabetic Nurses.

Striving to maintain a healthy body weight and fat percentage can greatly help prevent Diabetes Mellitus (DM), a leading cause of disability and death. Health professionals and researchers calculate the BMI by Quetelet's index i.e.  $\text{wt(kg)/ht(m)}^2$ . National Institute of Health (NIH) identifies overweight as a BMI of 25-29.9 and obesity as a BMI of 30 or greater<sup>1</sup>. BMI can be greater with muscular physique i.e. athletes or those who have a heavy bony structure. Waist circumference is a measure of visceral fat indicating insulin resistance<sup>2</sup>.

"Stress" can also alter blood sugar level in two ways i.e. adrenaline and glucocorticoids change the blood sugar levels, particularly for those who are suffering from Type II DM<sup>3</sup>. Secondly stress suppresses the body from producing insulin, so this also adversely affects the blood glucose level of diabetics<sup>4</sup>. Those patients who are taking drugs for DM and also have stress they attribute most of symptoms like tachycardia and sweating to "Hypoglycaemia" which may not be true and look for a chance to eat sweet things or junky foods. Both obesity and stress catalyzes the event and lead to a bad blood sugar level controls amongst Type II diabetics.

## Patients and methods

This was a hospital based, observational study, carried out in out patient department of Mayo Hospital, Lahore. All those known type II diabetics both males and females between the period of 1<sup>st</sup> July to 31<sup>st</sup> December 2002, who reported to one of the medical units on their out patient take days were documented. These diabetics were taking treatment and had come for further consultation. Type I DM and pregnant diabetic female patients were excluded. A standard proforma was filled by undergraduate students for various parameters. Age, sex, BMI, duration of DM, Random blood sugar by glucometer, treatment taken, stresses of life and eating patterns were recorded. Stress

was scored on a scale of 1-4 while BMI was classified as follows:  $\leq 20$  normal = 20-24.9 overweight, = 25-29.9; obese  $> 30$ . This data was later analyzed by the statistician applying "t" test.

## Results

Sixty two patients were studied, (40 were females and 22 were males), with a F:M ratio of 2:1. Age range was 32-72 years with the mean of  $50.87 \pm 7.86$ , duration of DM was in the range of 1-17 years with the mean of  $6.61 \pm 3.89$  Random blood sugar was in the range of 133-410 mg% with the mean of  $234.55 \pm 72.68$ . Six (9.67%) patients, (2 male and 4 females) had BMI of 20; 20 patients (32.27%) had normal BMI of 20-24.9; 30(48.39%) patients were overweight with a BMI of 25-29 and 6 patients (9.67%) were obese with BMI of 30-39.9. (Table I). All these patients were taking oral hypoglycaemic agents; 20(32.27) were on single drug, 36 (59.06%) were on combination of two drugs and 6(9.67%) were combination of three drugs. Stress was scored on a scale 1-4, 22(35.48%) had a single cause of stress, 30(48.39%) had two causes of stress and 10(16.13%) had more than two causes of stress.(Table II)

## Discussion

DM is a serious metabolic disorder. It's incidence is growing in volumes in developed countries and more so in developing countries. It is also like an epidemic in Pakistan. This problem of DM has certain modifiable risk factors, of course one cannot change the genes, but can look after other modifiable risk factors i.e. BMI and stress.

Out of these BMI is very important major risk factor, whereas every overweight will not develop DM. But there are chances of developing DM and one can lessen this chance by body weight management through a combination of diet and physical activity. Diabetics in overweight or obese range develop insulin resistance, so

they develop hyperglycaemia<sup>2,6</sup>. This insulin resistance does not only give rise to a bad control of blood sugar, rather it also increases the risk of hypertension, hypertriglyceridemias, high LDL-C level, low HDL-C level and thus greater chances of coronary artery disease and strokes<sup>2,5,6</sup>. In the present study 58.06% were either overweight or obese. Barry<sup>7</sup> Bittman has reported that Type II diabetics 67% had a BMI of 27 and 46% were in obese zone, which is different from the present study. Australian Institute of Health and welfare reports association between Type II DM and obesity, is so strong that most of DM sufferers they go together like a "horse and carriage". Eighty nine percent of type II diabetic Australians had BMI in overweight or obese zone, which is much greater than the present study<sup>8</sup>. If raised BMI is coupled with stress that adds fuel to the fire. Both of these do not only disturb glycaemic control, but they also aggravate complications of DM like hypertension, angina, heart rhythm irregularities, irritable bowel syndrome, ulcers, erectile dysfunction and strokes<sup>9,10</sup>. In the present study all the patients had stresses ranging from 1-4, 35.48% had a single cause of stress, 48.39% had two causes for stress and 16.13% were having either three or more causes of stress. These stresses were job related like loss of job, inability to carry out job demands, loss of workdays and hours, economic stresses which were a combination of either low income or more expenses coupled with treatment cost.

As seen in this study the blood sugar level was 133-410 mg% (mean 234.55±72.68%). Those diabetics who had normal weight and a single stress factor were having controlled sugar levels, on the other hand those who were obese and more stresses were having high levels of blood sugar levels. Researchers in Duke University report that if stress is managed in Type II diabetics that controls their blood sugar levels more effectively<sup>11</sup>. American Diabetic Association in one of its reports has mentioned that mentally stressed diabetics have hyperglycaemia. This hyperglycaemia could be result of many reasons like, patients stop taking care of themselves, they do not have enough time or forget to check their blood glucose levels, do not take proper meals, overeat or do less physical activity and most important is that stress hormones may also alter blood glucose levels directly<sup>3,12,13</sup>.

Richard Survit<sup>14</sup> a medical psychologist at Duke University Medical Center studied Type II DM patients who had mental stress. He made two groups of these patients and in one group no management was done and in the second group stress management techniques were added to standard care, it was noted that it helped reduce glucose levels and these patients had HbA<sub>1c</sub> 1% lower than the other group who were only on standard treatment. Stress management group were trained to identify the life stressors and how to respond to them with certain techniques as progressive muscle relaxation and breathing exercises<sup>15</sup>. It was noted that the change was so large that

you would expect such a change only from some diabetes control drugs, so it means that stress management helps in reducing the blood sugar level with less amount of drugs.

### Conclusion

Type II DM is not a trivial condition, and requires adequate control by various measures. The management includes maintaining ideal body weight, diet, exercise and drugs. If the balance is not kept in these, one may lose the glycaemic control and obesity and stress makes it worse. Stress management techniques are helpful and are being practiced at Diabetic Centers, training is imparted to patients by specialized nurses<sup>16</sup>, stress management is thought to be more beneficial as compared with anxiolytics as it makes the patient lazy and can lead to lack of exercise thus gain in weight and ultimately both of these will lead to hyperglycaemia. Hence it is mandatory to educate type II DM patients to achieve ideal body weight and try to avoid stresses to keep their blood glucose level under control to prevent complications of the disease, which can lead to disabilities and death.

Table I Patients demographics (n=62)

Male	22
Female	40
Mean age range 32-72 years	50.87 ± 7.86
Duration of DM 1-17 years	6.61 ± 3.89
Random blood sugar 133-410mg%	234.55 ± 72.68
Stresses	62
Single cause	22(35.48%)
Two causes	30(48.39%)
Multiple causes	10(16.13%)

Table II. BMI of D.M. patients

No.	Male	Female	BMI	%age
6	4	2	= 20	9.67
20	4	16	20-24.9 (normal)	32.27
30	12	18	25-29.9 (overweight)	48.39
6	2	4	30-39.9 (Obese)	9.67

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