

# Indian Diabetes Risk Score

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Variability is an inherent characteristic of the biological world. The globe today faces an epidemic of non-communicable diseases (NCD), which will soon surpass communicable diseases both in the developing and developed world. India is no exception, and both native and migrant Asian Indians are ethnically a particularly vulnerable race from the metabolic standpoint. However in NCD due to lack of a clear etiological agent it is heavily dependent on identifying and tackling risk factors. The risk factors like age, gender, family history are non-modifiable while others like smoking, diet, physical activity, hypertension, diabetes etc are modifiable. Thus for NCD a classic screening or preventive strategy may not work and principles of primordial prevention have to be applied. These lead to identification of "Risk Scores or Tests" like 'Framingham Risk Score' or criteria like cluster phenotypes viz "Metabolic Syndrome". The classic cardiovascular risk is assessed by the Framingham risk score while diabetes is assessed by the diabetes risk score by American Diabetic Association (ADA). Both are powerful tools; but in the last decade we also saw the emergence of a new term "Metabolic Syndrome".

However this term Metabolic Syndrome had different definitions by National Cholesterol Education Program (NCEP), World Health Organization (WHO), International Diabetes Federation (IDF), American Association Clinical Endocrinology (AACE), EGIR (European Group of Insulin Resistance) with different variables. Recently the IDF in April 2005 came out with a consensus definition of "metabolic syndrome"<sup>1</sup> (Table 1) which incorporated all the suggestions from US oriented NCEP and the European EGIR & WHO versions. Also they laid down race and geography specific cut-offs for auxological criteria for waist circumference like those for South east Asians being > 80 cm for females and >90 cms for males respectively. However even the new definition of metabolic syndrome misses out on the power to unmask underlying genetic component viz. family history, occupation, physical activity, smoking etc. Type 2 DM was included in NCEP and WHO definition but not in the AACE definition. The short-comings of ATP III Criteria for Diagnosis of the Metabolic Syndrome are that it does not consider impact of age and has a low sensitivity for identifying insulin

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**Table 1 : The New International Diabetes Federation (IDF) Definition of Metabolic Syndrome**

According to the new IDF definition, for a person to be defined as having the metabolic syndrome they must have:

- Central obesity (defined as waist circumference  $\geq 90$  cm for Asian men and  $\geq 80$  cm for Asian women, with ethnicity specific values for other groups)

Plus any two of the following four factors:

- Raised TG level:  $\geq 150$  mg/dL (1.7 mmol/L), or specific treatment for this lipid abnormality
- Reduced HDL cholesterol:  $< 40$  mg/dL (1.03 mmol/L\*) in males and  $< 50$  mg/dL (1.29 mmol/L\*) in females, or specific treatment for this lipid abnormality
- Raised blood pressure: systolic BP  $\geq 130$  or diastolic BP  $\geq 85$  mm Hg, or treatment of previously diagnosed hypertension
- Raised fasting plasma glucose (FPG)  $\geq 100$  mg/dL (5.6 mmol/L), or previously diagnosed type 2 diabetes

If above 5.6 mmol/L or 100 mg/dL, OGTT is strongly recommended but is not necessary to define presence of the syndrome.

\* These values have been updated from those originally presented to ensure consistency with ATP III cut-points

resistant individuals with elevated risk for cardiovascular disease (CVD).

The Framingham score for coronary artery disease and diabetes risk score for diabetes are far more independent predictors with a better odds ratio than metabolic syndrome alone. The elements of the Framingham CVD risk score are sex, age, total cholesterol, smoking history, systolic blood pressure while those of diabetic risk score are age, sex, BMI/WHR and family history of diabetes. The odds ratio (OR) of predicting diabetes by multivariate analysis both in the San Antonio Heart Study (SAHS)<sup>2</sup> and Mexico City Diabetes Study (MCDS)<sup>2</sup> were 5.5 and 4 respectively based on Diabetes Risk Score compared to metabolic syndrome by NCEP which fared poorly at an odds ratio of 1.6 (SAHS) and 1.2 (MCDS) respectively. We can therefore conclude that diabetes risk score is a better predictor than metabolic syndrome. Similarly the Framingham Risk Score when compared to this outperforms on the odds ratio for predicting CVD. A multivariate analysis of San Antonio Heart Study had an odds ratio of 9.1 for Framingham Risk Score predicting CVD compared to 1.1 for metabolic syndrome. Therefore for predicting DM or CVD alone, metabolic syndrome scored very poorly.

Metabolic syndrome is a phenotype and therefore helps to identify subjects with high risk based on easily

measurable biological variables, but lacks some critical variables which enhance the predictions. 'Metabolic Syndrome' is now under intense scrutiny and controversy. Global associations like ADA and EASD may even abandon it, and are issuing a joint statement as too much critically important information is missing to warrant its designation as "Syndrome".<sup>3</sup> Gerald Reaven, the discoverer of the metabolic syndrome recently wrote an obituary of it and conducted a detailed post-mortem. In his conclusion, it appears that making the diagnosis of the metabolic syndrome does not bring with it much in the way of pathophysiologic understanding or clinical utility, and deciding that individuals do not have it because they fail to satisfy three of five arbitrarily chosen criteria may withhold relevant therapeutic intervention. Does the ATP III concept of the metabolic syndrome have any redeeming virtues? That is a question that only the reader can answer.<sup>4</sup> Scot Grundy defended in an elegant debate the scientific facts to keep metabolic syndrome alive. But after Dr. Gerald Reaven's post mortem and joint statement by both ADA and EASD, prospects of survival of metabolic syndrome look bleak despite of the IDF initiative. Thus diabetes or cardiac risk scores will outscore 'metabolic syndrome' in future.<sup>5</sup>

This risk factor approach needs aggressive identification for planning prevention strategies and for early diagnosis. Several diabetic risk scores or risk engines have been devised for the last decade. They have been devised for prevention programs in the USA, Scandinavia and U.K. The 'ADA' website has a simple questionnaire for general population which is based on age. The ADA website has a simple user friendly risk test.<sup>6</sup> Risk test by ADA to detect diabetes is shown in Table 2.

**Table 2 : ADA risk test**

|  | Yes  | No   |
|--|------|------|
| 1. My weight is equal to or above that listed in the BMI chart*?                         | 5pts | 0pts |
| 2. I am under 65 years of age <u>and</u> I get little or no exercise during a usual day? | 5pts | 0pts |
| 3. I am between 45 and 64 years of age?  | 5pts | 0pts |
| 4. I am 65 years old or older?   | 9pts | 0pts |
| 5. I am a woman who has had a baby weighing more than nine pounds at birth?              | 1pts | 0pts |
| 6. I have a sister or brother with diabetes?   | 1pts | 0pts |
| 7. I have a parent with diabetes?  | 1pts | 0pts |

**Scoring 3-9 points :** You are probably at low risk for having diabetes now. But don't just forget about it — especially if you are Hispanic/Latino, African American, American Indian, Asian American, or Pacific Islander. You may be at higher risk in the future.

**Scoring 10 or more points :** You are at greater risk for having diabetes. Only your health care provider can determine if you have diabetes. At your next office visit, find out for sure.

**\*At-risk weight chart body mass index**

| Height in feet and inches without shoes | Weight in pounds without clothing |
|---|-----------------------------------|
| 4'10"                                   | 129                               |
| 4'11"                                   | 133                               |
| 5'0"                                    | 138                               |
| 5'1"                                    | 143                               |
| 5'2"                                    | 147                               |
| 5'3"                                    | 152                               |
| 5'4"                                    | 157                               |
| 5'5"                                    | 162                               |
| 5'6"                                    | 167                               |
| 5'7"                                    | 172                               |
| 5'8"                                    | 177                               |
| 5'9"                                    | 182                               |
| 5'10"                                   | 188                               |
| 5'11"                                   | 193                               |
| 6'0"                                    | 199                               |
| 6'1"                                    | 204                               |
| 6'2"                                    | 210                               |
| 6'3"                                    | 216                               |
| 6'4"                                    | 221                               |

If you weigh the same or more than the amount listed for your height, you may be at risk for diabetes.

To find out if you are at risk, write in the points next to each statement that is true for you. If a statement is *not* true, write a zero. Then add all the points to get your total score. Similarly the Finnish Diabetes Risk Score is devised and stated in Table 3.<sup>7</sup>

**Table 3 : The diabetes risk score by Finnish Group**

| Variables   | Score |
|---|-------|
| Age (years)   |       |
| 45-54   | 2     |
| ≥55   | 3     |
| BMI (Kg/m <sup>2</sup> )  |       |
| >25 to ≤ 30   | 1     |
| >30   | 3     |
| Waist circumference (cm)  |       |
| Men, 94 to <102; Women, 80 to <88   | 3     |
| Men, ≥102; women ≥88  | 4     |
| Have you ever used drugs for high blood pressure?   |       |
| No  | 0     |
| Yes   | 2     |
| Has a physician or other health care provider ever told you that you have high blood glucose?     |       |
| No  | 0     |
| Yes   | 5     |
| Do you exercise or exert yourself in your spare time or at work at least 30 minutes on most days? |       |
| No  | 0     |
| Yes   | 2     |
| How often do you eat vegetables and fruits or berries?  |       |
| Every day   | 0     |
| Not every day   | 1     |

The Inter99 study has developed the targeted screening for the Danish population a Danish Diabetes Score.<sup>8</sup> All these scores are useful mass screening tools which are based on population based criteria from the respective countries.

Similar cohorts can be therefore modelled from India. Mohan *et al's* group from their Chennai Urban Rural Epidemiology Study (CURES) cohort have attempted to develop a simple user friendly Indian Diabetes Risk Score<sup>9</sup> (Table 4).

**Table 4: Indian Diabetes Risk Score [IDRS]**

| Particulars                                      | Score |
|--|-------|
| Age [years]                                      |       |
| < 35 [reference]                                 | 0     |
| 35 - 49  | 20    |
| ≥ 50   | 30    |
| Abdominal obesity                                |       |
| Waist <80 cm [female] , <90 [male] [reference]   | 0     |
| Waist ≥ 80 - 89 cm [female], ≥ 90 - 99 cm [male] | 10    |
| Waist ≥90 cm [female], ≥ 100 cm [male]           | 20    |
| Physical activity                                |       |
| Exercise [regular] + strenuous work [reference]  | 0     |
| Exercise [regular] or strenuous work             | 20    |
| No exercise and sedentary work                   | 30    |
| Family history                                   |       |
| No family history [reference]                    | 0     |
| Either parent                                    | 10    |
| Both parents                                     | 20    |
| Minimum score                                    | 0     |
| Maximum score                                    | 100   |

Do we really need a score for India? Yes we have 32 million Indians with diabetes and have the largest diabetic pool in the world. The problem is further compounded by the fact that 66% of Indian Diabetics are not diagnosed as compared to 50% in Europe and 33% in USA. Therefore a diabetes risk score will help us to devise effective screening strategies to unmask hidden burden of the disease. Personally, I am a strong proponent of universal screening and advocate that in high risk urban cities in India like Mumbai, Delhi, Chennai, etc everyone should be screened. However universal screening is neither cost effective nor feasible. There is an urgent need for mass screening programmes. However, it is difficult and expensive to screen everyone [universal screening]; hence selective screening is necessary to make screening cost-effective. Therefore there is a need for having an Indian Diabetes Risk Score. This can come only from a geographical cohort with urban and rural component. The CURES is a classic cohort which has generated a risk score called IDRS with two modifiable risk factors (waist circumference and physical inactivity) and two non-modifiable risk factors (age and family history of diabetes), which may be amenable to intervention.

The IDRS has a sensitivity of 72.5% and specificity of 60.1% and is derived based on the largest population based study on diabetes in India CURES. The advantage

of IDRS are its simplicity, low cost and is easily applicable for mass screening programmes. IDRS should be tested in other population based studies in India-both rural and urban. Prospective follow up studies on non-diabetic subjects with high-risk score are needed to assess the predictive nature of IDRS. IDRS may be predictive of metabolic syndrome and cardiovascular disease as three of the factors [age, physical activity and waist circumference] are risk factors for both metabolic syndrome and cardiovascular disease. IDRS uses two modifiable risk factors (waist circumference and physical inactivity) and two non-modifiable risk factors (age and family history of diabetes), providing a clear message that if modifiable risk factors are altered, the risk score can be considerably reduced. Subjects with high IDRS regardless of their blood sugar status, are ideal candidates for life style modification as these are risk factors for not only diabetes but also for cardiovascular disease. The new IDRS score is simple user friendly and is currently tested in the CURES cohort. It will need validation in other population based studies from within different Indian states. It will also get modified in the process. The physical activity and family history may get modified. Also several other institutions possibly will come with their own scores or modifications (The IDRS). This score may be incorporated into the proposed Indian National Diabetes Programme and surveillance studies on NCD by WHO and ICMR. The score will no doubt need further validation in future studies.

## REFERENCES

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