# Body Mass Index: Where We Will Go by The Year 2030!

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**Abstract**

***Background:*** *The prevalence of diabetes mellitus is increasing throughout the world, mostly type 2 diabetes mellitus and largely contributed by increasing body mass index (BMI). This study was designed to compare BMI of newly detected diabetic patients in two different Bangladeshi cohorts spaced over 25 years.*

***Methods:*** *This was a retrospective study from hospital records from two cohorts: 1981 to 1985 and 2006 to 2010. Patients were divided in 4 groups according to BMI and comparison was made. BMI of newly detected diabetic patients from 2011 and 2012 were also compared.*

***Results:*** *Age at diagnosis of diabetes was lower in 2006-2010 group than 1981-1985 group. Frequency of diabetes at lower BMI has fallen by half in 2006-2010 group when compared with those of 1981-1985 group. Frequency of diabetes at higher BMI groups has an increasing trend in 2006-2010 group than in 1981-1985 group.*

***Conclusion:*** *Results from this study concludes that there is an increasing trend of diabetes detection at lower age group and with higher BMI among Bangladeshi population.*

***Key words:*** *Bangladesh, body mass index, diabetes mellitus, insulin resistance.*

## Introduction

The morbidity and mortality associated with being overweight or obese have been known to the medical profession since the time of Hippocrates, more than 2500 years ago. Obesity is measured by using body mass index (BMI), calculated by weight in kg divided by height in meter[2]. Overweight refers to a weight above the "normal" range, with normal defined as on the basis of actuarial data. Overweight for Europeans and Americans is defined as a BMI of 25 to 29.9 kg/m$^2$; obesity is defined as a BMI of $\geq$30 kg/m$^2$, severe obesity is defined as a BMI $\geq$40 kg/m$^2$ (or $\geq$35 kg/m$^2$ in the presence of comorbidities). The normal BMI is < 25 kg/m$^2$ according to International Diabetic Federation (IDF). Though for Asians, cutoff value is recommended as 23 (not 25) and accordingly at all stages of overweight or obesity $\geq$2 points lower than Europeans like 23, 27, 35 instead of 25, 30, 40 respectively. Recently American Diabetic Association (ADA) also endorsed the recommendation of IDF, that is lower cutoff for Asians, as Asians are considered at risk of diabetes and cardiovascular disease with lower BMI (2.0 to 3.0 points than Europeans or Americans).[1,2] Asians are more at risk of developments of coronary artery disease (CAD) and diabetes at lower BMI, specifically, obesity and increased central fat are associated with diabetes mellitus, hypertension, heart disease, stroke, sleep apnea and many chronic and debilitating diseases. As BMI and type 2 diabetes mellitus are now almost synonymous, the term

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"diabesity" is used to denote obesity and diabetes. Even modest weight loss improves these comorbidities. Although these categorical definitions are clinically useful, it is clear that the risks imparted by increasing body mass follow a continuum. Our aims were to analyze data to see the changes in BMI in last 30 years among selected group of Bangladeshi diabetic subjects.

**Methods**

This was a retrospective study from hospital records from two cohorts: 1981 to 1985 and 2006 to 2010. All the subjects were newly diagnosed as diabetic. They were registered in a tertiary care hospital of Diabetes and Endocrinology. Required data included age, sex, height and weight. BMI was calculated by using weight in kg divided by height in meter$^2$. BMI was recorded in 4 groups. Group I: BMI < 19 kg/m$^2$, Group II: BMI 19 - <25 kg/m$^2$, Group III: BMI 25 - <28 kg/m$^2$ and Group IV: BMI > 28 kg/m$^2$. The data were analyzed to see the changes in BMI among the subjects enlisted in 1981 to 1985 and subjects enlisted during the period of 2006 to 2010. We also compared BMI of newly enlisted diabetic patients in the years 2011 and 2012.

**Results**

In 1981 to 1985 (5 years), total numbers of enlisted newly diagnosed diabetic patients were 22,663 with a mean age of 47±15 years for males and 49±11 for females. Among them, male were 16,049 (70.8%) and female were 6,614 (29.2%). The male and females in each BMI group were as: Group I: M: 16.1% and F 13.3 %; Group II: M 46.2% and F 46.9%; Group III: M 33.5% and F: 22.5%; and in Group IV: M 4.2% and F 17.3% (Table I).

In 2006 to 2010 (5 years), total numbers of enlisted newly diagnosed diabetic patients were 91,974 with a mean age of 41±13 years for males and 42 ±11 for females. Among them, male were 47,056 (51.2%) and female were 44,918 (48.4%). The males and females in each BMI group were as: Group I: M 11.4% and F 9 %; Group II: M 57.3% and F 44.5%; Group III: M 20.4% and F 23.9%; and in Group IV: M 10.9% and F 22.5% (Table I). The mean BMI of newly registered diabetic patients in 2011 and 2012 were 25.6±4.6 kg/m$^2$ and 24.7±4.0 kg/m$^2$ respectively.

On comparison of the two cohorts of 1981-1985 and 2006-2010, it was observed that newly registered diabetic patient in lower BMI group (Gr I) were reduced by 50% in 2006-2010 cohort for both males and females (Table I); on the other hand frequency of diabetic patients with higher BMI groups (Gr III and Gr IV) had variable trends, but in Gr IV two-thirds increased for males and nearly one-fourth increased for females (Table I).

| Table I. BMI change according to sex in four groups between two cohorts | | | | | | |
|---|---|---|---|---|---|---|
| Year (total) | Sex | Number (%) | Gr I | Gr II | Gr III | Gr IV |
| 1981-1985(22663) | Male | 16049 (70.8) | 16.1% | 46.2% | 33.5% | 4.2% |
| 2006-2010(91974) | Male | 47056 (51.2) | 11.4% | 57.3% | 20.4% | 10.9% |
| Changes | --- | --- | -43% | +19.4% | -64.2% | +61.5% |
| 1981-1985(22663) | Female | 6614 (29.2) | 13.3% | 46.9% | 22.5% | 17.3% |
| 2006-2010(91974) | Female | 44918 (48.8) | 9.1% | 44.5% | 23.9% | 22.5% |
| Changes | --- | --- | -46.2% | -5.3% | +5.9% | +23.1% |

## Discussion

BMI is a very important indicator of health and disease particularly for non-communicable diseases (NCDs). Increased BMI is associated with insulin resistance, type 2 diabetes mellitus and cardiovascular and all cause mortality.[3] Our study findings are consistent with this; the percentage of diabetic population with a higher BMI has increased over decades and we predict this rise will continue unless appropriate interventions are taken.

Obesity is increasing globally, Bangladesh is not an exception. It is now established that Asians with lower BMI are at increased risk of development of type 2 diabetes mellitus and cardiovascular diseases which contributes significant burden of morbidity and mortality in developing countries like Bangladesh.[2] Rahman MM, et al[4] in a study had found a mean BMI of 25.5 kg/m^{2} among newly detected Bangladeshi diabetic patients in 2015, while Haque HF, et al[5] reported almost similar findings among diagnosed Bangladeshi diabetic patients in 2016. Higher BMI at detection of diabetes is reported from different countries including India[6], Chaina[7], Korea.[8] Ethnic variations for cut off values for BMI classes are also emphasized.[1,9]

Calorie intake became twice in last 25 years according to Bangladesh National Survey.[10] Calorie intake was 1707 Kcal in 1976-77 and increased to 2344 KCal in 2010. Protein intake was 41.4 gm per day in 1976-77 and increased to 69.11 gm in 2010 (Table II). This is the results of rapid urbanization, unhealthy lifestyle and socioeconomic developments.

**Table II.** Calorie and protein intake (per capita, Kcal, gm per day)

|  | Rural | | Urban | |
| --- | --- | --- | --- | --- |
|  | Calorie | Protein | Calorie | Protein |
| 1976-77 | 1707 | 41.4 | 1866 | 49.9 |
| 2005 | 2253 | 61.74 | 2193 | 64.88 |
| 2010 | 2344 | 65.24 | 2244 | 69.11 |

**Source:** Statistical Year Book 1983 and 2013. Household Survey. Bangladesh Bureau of Statistics (BBS).

The prevalence of diabetes is increasing in Bangladesh. In 2013 according to IDF the prevalence of diabetes in Bangladesh was 6.3%, in 2017 6.9%, but some studies estimated 8.5% to 10%.[11] The age of detection/onset of diabetes (mostly type 2 diabetes mellitus) is early among 2 cohorts of 5 year time (1981-1985 and 2006-2010). This rate of increment of BMI as well as early onset of diabetes (more younger age) is supposed to be results of rapid urbanization and improper lifestyle. Moreover, the economic status change positively affects calorie intake and BMI. The average per capita total calorie intake in both rural and urban communities is increased from 1976-77 to 2010. Protein intake is also increased. Moreover rate of sedentary lifestyle is increased due to rapid urbanization. Per capita income increased from 900 to 1314 USD in last 5 (2011-2015) years. Underweight diabetic is significantly lower. Females are getting more obese than the males. If, necessary actions to combat obesity is not taken care immediately, it will put tremendous burden on the healthcare in near future.

**Conflict of interest:** Nothing to declare.

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