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## Original Article

# Assessment of Glycaemic Status, BMI and Dyslipidemia in a Group of Official Population of Bangladesh

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**Abstract**

***Introduction:*** *Obesity and dyslipidemia are emerging as major public health challenges in South Asian countries. The prevalence of obesity is more in urban areas than rural. Increasing obesity and dyslipidemia in South Asians is primarily driven by nutrition, lifestyle and demographic transitions, increasingly faulty diets and physical inactivity, in the background of genetic predisposition.*

***Aim:*** *The aim of the study was to assess the glycaemic status with BMI and lipid profile in a group of official population of Bangladesh.*

***Methodology:*** *This prospective observational study was conducted in BIRDEM General Hospital during a period of one year from January 2013 to December 2013. 599 Working officials of 50 years of age and above were studied during their yearly health checkup. Body Mass Index (BMI) was used to assess the general obesity. This population group was also assessed for Metabolic Derangement by Fasting Blood Glucose, 2 Hours after Breakfast Blood Glucose, HbA1C and fasting Lipid Profile.*

***Results:*** *470 out of 599 study populations had some form of glycaemic abnormality. Diabetes Mellitus Type-2 were found in 238 (39.73%), 113 (18.86%) had IGT and 119 (19.86%) had IFG. It was revealed from BMI assessment that 48.4% of the study population was overweight and 12.8% had obesity of different grades. All patients were evaluated for lipid status in fasting state. 326 (54.4%) had raised LDL, 361 (61.3%) low HDL and 289 (48.2%) had raised Triglycerides.*

***Conclusion:*** *This study reflects the high incidence of overweight subjects with more tendency to have lower HDL, high LDL and Triglyceride cholesterol. There was also high incidence of abnormal Glycaemic status in this specific small group of population focusing the future needs of thorough assessment at multicentre level in different groups of population to estimate the real scenario of the nation.*

***Key words:*** *Glycaemic Status; BMI; Dyslipidemia.*

**Introduction:**

Non-communicable diseases (NCDs) are emerging as a major health challenge in South Asians, which encompass residents of India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan and Maldives, constituting 24% of the world's population. [1] According to the World Health Organization, NCDs including type 2 diabetes mellitus (T2DM), cardiovascular diseases (CVDs), chronic obstructive airways disease (COPD), cancer, injuries and mental disorders are the cause of 59% mortality, and are going to account for 72% of total mortality by 2030 in South Asia. [2-4]

Globally, prevalence of obesity has doubled in the last two decades. In 2008, more than 1.6 billion adults over 20 years were overweight, of these, over 200 million men and nearly 300 million women were obese.[5] About 44% of the diabetes burden and 23% of the CVD burden is attributable to overweight and obesity; and mortality due to obesity occurs in 2.8 million adults each year.[6-8] It has been observed that 65% of the world's population lives in countries where overweight and obesity are responsible for higher mortality than is underweight. Obesity is associated with several co-morbid conditions: dyslipidemia, hypertension, hyperglycemia, non-alcoholic fatty liver disease (NAFLD) and a conglomeration of conditions known as the metabolic syndrome. Almost one third of the population of developed countries is detected to be having dyslipidemia; however, prevalence varies depending on ethnic group studied.[9-10] There is a wide variation in the prevalence of dyslipidemia in India depending on habitat, socioeconomic stratum and lifestyle practices. [11] Obesity is increasing at an alarming rate throughout the world and has become a global problem. The World Health Organization (WHO) has declared overweight as one of the top of 10 health risks in the world and one of the top five in developed nations. [12] According to recent estimates, there are more than one billion overweight people worldwide, and some 250 million of these are estimated to be clinically obese, equivalent to 7% of the world adult population.[13] Once considered a problem related to affluence, obesity is now fast growing in many developing countries and in poor neighborhoods of the developed countries.[14] Nowadays, there is an increasing trend of overweight and obesity in Bangladesh.[15] Incident of rapid demographic transition, sustainable economic development, rapid urbanization, and changing lifestyle and dietary patterns are some of the important causal factors for the emergence of overweight and obesity in developed and developing countries.[16] Furthermore, this chronic condition has been linked to the development of diabetes and cardiovascular disease, endometrial, colon, postmenopausal breast, and other

cancers; and certain musculoskeletal disorders, such as knee osteoarthritis later in life.[17]

Dyslipidemia signifies the increased concentration of total cholesterol and LDL cholesterol, decreased concentration of HDL cholesterol and hypertriglyceridemia present alone or in combination. A combination of lipid abnormalities e.g. hypertriglyceridemia and low HDL, are metabolically interlinked and have been termed as "atherogenic dyslipidemia". [18-19] This pattern of dyslipidemia has shown a strong association with T2DM and CVD in several studies in developed countries. [19-20] In particular, HDL levels are lower in South Asians than in White Caucasians as shown consistently in several comparative studies. Importantly, the prevalence of atherogenic small, dense LDL was significantly higher in Asian Indians compared with white Caucasians in USA (44% *vs.* 21%; $p < 0.05$) [21] and may contribute to increased tendency for CVD in this ethnic group. Finally, plasma concentration of adipose tissue metabolites, leptin and non-esterified fatty acids are higher and adiponectin levels are lower in insulin resistant Asian Indians as compared to more insulin sensitive Caucasians and could contribute to insulin resistance and atherogenic dyslipidemia. [22] This study was undertaken to assess the relation of Glycaemic Status with BMI and Dyslipidemia in a group of official population in Bangladesh.

**Materials and Methods:**

This prospective observational study was conducted in Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM) General Hospital during a period of one year from January 2013 to December 2013. 599 Working employees of Bangladesh Bank (Main Branch) of 50 years of age and above were studied during their yearly health checkup. An informed, voluntary written consent was obtained from each participant before enrolment. Detailed medical history and physical examination of the study population were entered in a data sheet. All the subjects sent by the Bank authorities were evaluated. Patients with physical disability and known psychiatric illness were excluded. These Bank officials were mostly involved in sedentary like desk works and their duty schedule was forty (8×5) hours in a week throughout the year.

Body Mass Index (BMI) of the study population was calculated by measuring the body height and weight with the subject standing motionless on the weighing scale, feet about 15 cm apart and the weight equally distributed on each leg. Subjects were instructed to wear minimum outwear (as culturally appropriate) and no footwear while their weight was being measured. According to WHO, BMI of 25-29.9 $kg/m^2$ was considered as overweight 30-34.9 $kg/m^2$ as Obesity Grade-I, 35-39.9 $kg/m^2$ as Obesity Grade-II, ≥40 $kg/m^2$ as Obesity Grade-III and ≤18.5 $kg/m^2$ as underweight.[23] This population group was also assessed for Metabolic Derangement by Fasting Blood Glucose, 2 Hours after Breakfast Blood Glucose for those who were previously diagnosed as Diabetes and OGTT for those who were previously Non-Diabetes. The HbA1C and fasting Lipid Profile were measured in all subjects. Blood glucose in fasting state ≥7.0 mmol/L, 2 hours after having 75 gm glucose ≥ 11.1mmol/L and HBA1c ≥ 6.5% was considered as Diabetes. Impaired Fasting Glucose (IFG) was considered those with fasting glucose ranging from 6.0- 6.9 mmol/L and Impaired Glucose test (IGT) was considered among those whose blood glucose after 75 gram glucose intake ranging from 7.8- 11.0 mmol/L (According to WHO criteria).

Data was analyzed for mean, percentage, standard deviation, chi square test, multiple correlation and multivariate analysis, by using SPSS-20 version. The t-test and chi square test was done for quantitative and qualitative analysis, respectively. P-value <0.05 was considered significant.

**Results:**

Total 599 study population of 50 year of age and above were studied from January 2013 to December 2013 in BIRDEM General Hospital.

Socio-demographic character of the study population are shown in Table-I.

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**Table I:**

| Variables | Parameters | No of Subjects | % of total Study Subjects |
|---|---|---|---|
| **Age (years)** | 50-55 | 297 | 49.6% |
| | >55 | 302 | 50.4% |
| **Sex** | Male | 533 | 89.0% |
| | Female | 66 | 11.0% |
| **Monthly Income** | | | |
| **(BDT)** | 30000-50000 | 424 | 70.78% |
| | 50000-100000 | 172 | 28.71% |
| | 100000-300000 | 3 | 0.5% |

470 out of 599 study populations had some form glycaemic abnormality. Different types of glycaemic status are shown in Figure-1.

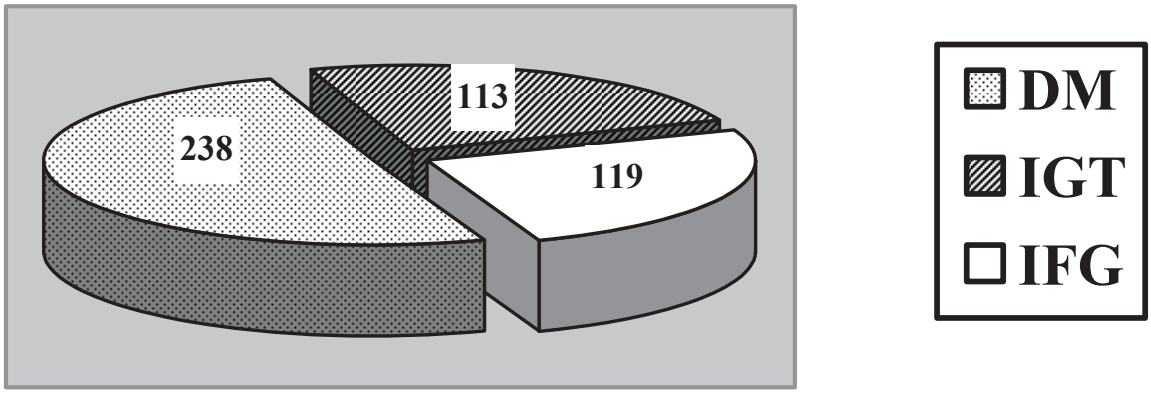


**Fig-1**

HbA1c level among the Diabetes Population are shown in Table-II.

**Table II:**

| | HbA1c (%) | | | | |
|---|---|---|---|---|---|
| | **<6.5** | **6.5-7.5** | **7.5-9.5** | **≥9.5** | |
| **Diabetes Subject** | 74 (31.09%) | 46 (19.32%) | 65 (27.31%) | 53 (22.26%) | 238 (100%) |

Different stages of BMI which was assessed during annual checkup are given with their percentage in Table-III.

**Table III:**

| BMI | No of Subjects | % of total study subjects |
|---|---|---|
| Under Weight | 3 | 0.5% |
| Normal | 229 | 38.2% |
| Over Weight | 290 | 48.4% |
| Obesity G-I | 69 | 11.5% |
| Obesity G-II | 6 | 1.0% |
| Obesity G-III | 2 | 0.3% |

All patients were evaluated for lipid status in fasting state. Status of the Lipid Profile in the study population is shown in Figure-2.

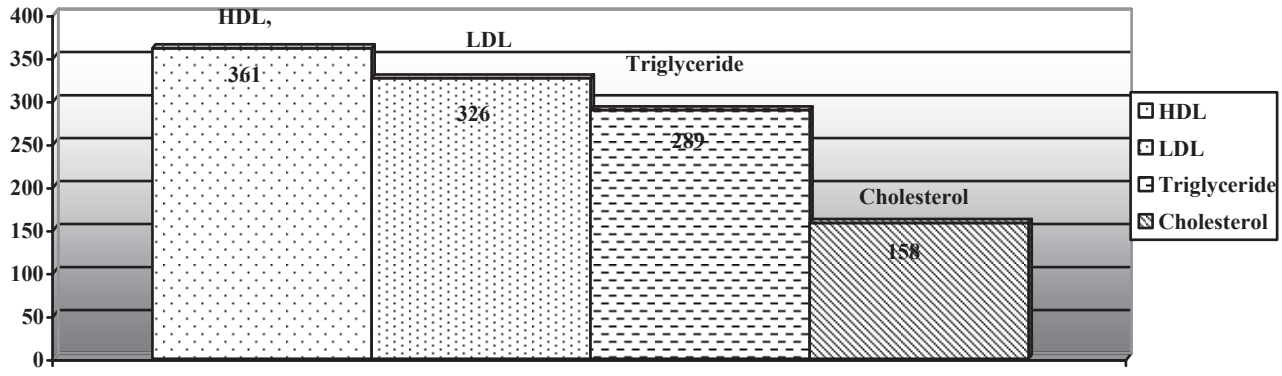


**Fig – 2**

Out of 599 study subjects 290 individuals were overweight and among them 181 (62.41%) had low HDL, 155 (53.44%) had high Triglyceride, 154 (53.10%) had high LDL and 71(24.48%) had high level of total Cholesterol. Among the 77 obese individuals 48 (62.33%) had low HDL, 43 (55.84%) had high LDL, 41 (53.24%) had high Triglyceride and 27 (35.06%) had high level of total Cholesterol. 229 individuals with normal BMI showed incidence of low HDL among 132 (57.54%), high LDL in 129 (56.33%), high Triglyceride in 93 (40.61%) and high level of total Cholesterol among 60 (26.20%). Relations of different stages of BMI with lipid profile are shown below.

Relation of different categories of BMI with Lipid profile are shown in Table-IV.

**Table IV:**

| BMI | HighCholesterol | High Triglyceride | Low HDL | High LDL |
|---|---|---|---|---|
| **Over Wt.** | 71 (24.48%) | 155 (53.44%) | 181 (62.41%) | 154 (53.10%) |
| **Obese** | 27 (35.06%) | 41 (53.24%) | 48 (62.33%) | 43 (55.84%) |
| **Normal** | 60 (26.20%) | 93 (40.61%) | 132 (57.54%) | 129 (56.33%) |
| **Total** | 158 | 289 | 361 | 326 |

Mean Standard deviation and p value between different stages of BMI and Dyslipidemia are shown in Table-V.

**Table V:**

| Variable | Mean ± SD | | | p value | | |
|---|---|---|---|---|---|---|
| | Over Weight | Obese | Normal | Over Wt. vs. Obese | Obese vs. Normal | Over Wt. vs. Normal |
| **Cholesterol** | 182.57± 118.61 | 177.25± 82.33 | 155.06± 78.87 | 0.58 | 0.39 | 0.08 |
| **Triglyceride** | 41.26± 19.21 | 40.34± 8.65 | 40.38± 8.61 | 0.76 | 0.90 | 0.55 |
| **HDL** | 103.81± 30.30 | 106.57± 34.24 | 107.79± 38.86 | 0.08 | 0.48 | 0.45 |
| **LDL** | 183.94± 99.35 | 181.39± 39.26 | 183.87± 76.09 | 0.81 | 0.67 | 0.92 |

Relations of different categories of BMI with Glycaemic status are shown in Table-VI.

**Table VI:**

| BMI | IFG | IGT | DM |
|---|---|---|---|
| **Over Wt.** | 64 (22.06%) | 61 (21.03%) | 122 (42.06%) |
| **Obese** | 16 (20.77%) | 13 (16.88%) | 32 (41.55%) |
| **Normal** | 38 (16.59%) | 39 (17.03%) | 84 (36.68%) |
| **Total** | 118 | 113 | 238 |

Mean Standard deviation and p value between different stages of BMI and Glycaemic status are shown in Table -VII.

**Table VII:**

| Variable | Mean ± SD | | | P value | | |
|---|---|---|---|---|---|---|
| | Over Weight | Obese | Normal | Over Wt. vs. Obese | Obese vs. Normal | Over Wt vs. Normal |
| IFG | 6.444± 0.29 | 6.435± 0.31 | 6.333± 0.21 | 0.68 | 0.54 | 0.34 |
| IGT | 8.744± 0.81 | 8.840± 0.84 | 6.462± 0.29 | 0.65 | 0.91 | 0.34 |
| DM | 13.994± 2.38 | 15.575± 3.91 | 6.350± 0.31 | 0.02 | 0.03 | 0.23 |

**Discussion:**

This is the first study that have been carried out among a group of Bangladesh Bank officials which showed that 61.2% of the study population had higher BMI in the form of overweight (48.4%) and obese (12.8%). This group of study population has a sedentary lifestyle and as they belongs to high income group (as per Bangladeshi standard of income) who consume high calorie food and many of them had Diabetes that may induce overweight or obesity. Overweight or obesity is associated with high mortality, disability, and a poor quality of life. [24] This is also the risk factor of diabetes mellitus, hypertension, dyslipidemia, CHD, depression and various type of cancer. In this study, 326 (54.4%) had raised LDL, 361 (61.3%) low HDL and 289 (48.2%) had raised Triglycerides. This study also showed that 39.73% (238) of population had DM, 19.86% (118) had IFG and 18.86% (113) had IGT. All these are well known risk factors for cardiovascular diseases proven in different international studies. In this study no significant difference were observed regarding different stages of glycemic status and dyslipidemia among different group of population with normal BMI, overweight and obese. It could be due to homogenous distribution of samples studied (e.g. similar age group, similar working environment, similar economical status, similar lifestyle and mostly male sex). Because of the occurrence of type 2 Diabetes, Dyslipidemia and other cardiovascular morbidities at a lower range of body mass index (BMI) among South Asians, a consensus guideline with newer cut-off values for both measures of overweight and obesity (BMI 23–24.9 $kg/m^2$ for overweight and ≥25 $kg/m^2$ for obesity) has already been developed for Asian Indians.[25]

This study was carried out in a small specific group of population having particular social, educational and economic background. So our study will not reflect glycemic status, dyslipidemia and BMI of the general population of Bangladesh.. So large scale multicenter studies involving different professional groups with different earning classes and other demographic parameters are needed to characterize our population on these metabolic disorders.

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