Research Article

Assessment of glycemic status and BMI of resident and non - resident female students of Jessore University of science and technology, Bangladesh

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ABSTRACT

Background: Glycemic status means blood glucose level in an individual is measure by using the term hyperglycemia and hypoglycemia. Hyperglycemia is a condition in which an excessive amount of glucose circulates in the blood plasma whereas hypoglycemia is below normal level of glucose in blood. Abnormal Glycemic status develops various short as well as long term health complications. Constant monitoring of health status of an individual's is important in maintaining good glycemic status in preventing development of hyperglycemia and hypoglycemia related complication.
Methods: Female students ages 20 – 23 of hall resident and non resident of Jessore University of Science and Technology were randomly selected. Fasting blood glucose data and Body Mass Index (BMI) were collected on the basis of family status, income and eating pattern, family environments using standard laboratory procedures.
Results: The study found that 68% resident students were in hypoglycemic whereas 60% nonresident female students were in hypoglycemic but hyperglycemic and acute hyperglycemic effect was totally absent in both group of students. Differences of BMI irregularities of both groups of students were not observed. Most of residential students (88%) were only depends on the provided food in the dining hall. Whereas nonresident students majority of them are belonged to upper middle class, living in their own house and their eating patterns were better than residential female students. Therefore, most of the nonresident female students are able to intake nutritious foods. As a result the hypoglycemic students were found less abundant in nonresidential student compared to the resident group. Therefore dieting habit is one of the most important reasons to develop irregular glycemic status.
Conclusions: The need of awareness of good health care practice, intake good quality nutritious diet, avoid of abnormal dieting practice is prerequisite to maintain static glycemic status which directly linked to good health.

Keywords: Glycemic status, BMI, Hal resident and nonresident, Blood glucose and socioeconomic status

INTRODUCTION

The glycemic status means the level of glucose in a person's blood. This status is measure by using the term hyperglycemia and hypoglycemia. In general the normal range of blood glucose level for most of the people is about 80 to 120 mg/dl (3.66 to 7.8 mmol/L). Hyperglycemia or high blood sugar is a condition in which an excessive amount of glucose circulates in the blood plasma. This is generally a glucose level higher than 11.1 mmol/L (200 mg/dl) but symptoms may not

start to become noticeable until even higher values such as 15-20 mmol/L (200-300 mg/dl). A subject with a consistent range between 100-126 mg/dl (American Diabetes Association Guidelines) is considered hyperglycemia, while above 126 mg/dl is generally held to have diabetes.[1] Temporary hyperglycemia is often benign and asymptomatic. Blood glucose levels can rise well above normal for significant periods without producing any permanent effects or symptoms. Chronic hyperglycemia at levels more than slightly above normal can produce a very wide variety of serious complications over a period of years, including kidney damage, neurological damage, cardiovascular damage, damage to the retina or damage to feet and legs. Diabetic neuropathy may be a result of long-term hyperglycemia. In diabetes mellitus (by far the most common cause of chronic hyperglycemia), treatment aims at maintaining blood glucose at a level as close to normal as possible, in order to avoid these serious long-term complications. This is done by a combination of proper diet, regular exercise and insulin or other medication such as Metformin, etc. In case of acute hyperglycemia, the blood glucose levels that are extremely high, is a medical emergency and can rapidly produce serious complications (such as fluid loss through osmotic diuresis). It is most often seen in persons who have uncontrolled insulin-dependent diabetes.

Most healthy adults maintain fasting glucose levels above 4.0 mmol/L (72 mg/dl) and develop symptoms of hypoglycemia, when the glucose falls below 4 mmol/L.[3] It can sometimes be difficult to determine whether a person's symptoms are due to hypoglycemia. Throughout a 24 hour period blood plasma glucose levels are generally maintained between 4-8 mmol/L (72 and 144 mg/dl).[4] Although 3.3 or 3.9 mmol/L (60 or 70 mg/dl) is commonly cited as the lower limit of normal glucose, symptoms of hypoglycemia usually do not occur until 2.8 to 3.0 mmol/L (50 to 54 mg/dl).[5] It can produce a variety of symptoms and effects but the principal problems arise from an inadequate supply of glucose to the brain, resulting in impairment of function (neuroglycopenia). Effects can range from mild dysphoria to more serious issues such as seizures, unconsciousness and (rarely) permanent brain damage or death.[6,7] Significant hypoglycemia appears to increase the risk of cardiovascular disease.[8] The most common forms of hypoglycemia occur as a complication of treatment of diabetes mellitus with insulin or oral medications. Hypoglycemia is less common in non-diabetic persons, but can occur at any age. Among the causes are excessive insulin produced in the body (hyperinsulinemia), inborn error of metabolism, medications and poisons, alcohol, hormone deficiencies, prolonged starvation, alterations of metabolism associated with infection and organ failure. Hypoglycemia is treated by restoring the blood glucose level to normal by the ingestion or administration of dextrose or carbohydrate foods. It is often self-diagnosed and self-medicated orally by the ingestion of balanced meals.

As both the hyperglycemia and hypoglycemia affected the health status of an individual's. So, constant monitoring of the health status of an individual's is important in order to maintain good glycemic status and prevent development of hyperglycemia and hypoglycemia. Various factors that influence glycemic status of an individual's such as nutritional intake, socio-economic status, functional status and psychological conditions.[9] Therefore the glycemic response is different from one person to another and also in the same person from day to day, depending on blood glucose levels, insulin resistance, and other factors. Most of the values on the glycemic status do not show the impact on glucose levels after two hours. Some people with diabetes may have elevated levels after four hours.[10]

Foods with carbohydrates that break down quickly during digestion and release glucose rapidly into the bloodstream tend to have a high GI; foods with carbohydrates that break down more slowly, releasing glucose more gradually into the bloodstream, tend to have a low GI.[11] A lower glycemic index suggests slower rates of digestion and absorption of the foods carbohydrates and may also indicate greater extraction from the liver and periphery of the products of carbohydrate digestion.[12] A lower glycemic response usually equates to a lower insulin demand but not always, and may improve long-term blood glucose control.[13]

The level of blood glucose low enough to define hypoglycemia may be different for different people, in different circumstances, and for different purposes, and occasionally has been a matter of controversy.[14] Besides these, BMI is one of the important anthripoimetric parameter used to measure the standard health status of an individual. Therefore in this study, we also emphasis to measure the BMI of the studied groups of the student. As hypoglycemia have serious effects on health. So we should have to special care about hypoglycemia. Jessore University of Science and Technology is one of the leading public University of Bangladesh. There are around 4500 students are studying in this university among them only 1500 students are female student. Among the female students around 500 students are resident and rest of the students are non-resident. Most of the students are comes from the lower and lower mild class family. Their eating patterns are different as they comes from different family. Currently, most of the female students have complaint the headache, dizziness and faint in the class room. Primary investigation indicated that most of female students have dieting for their health care. Besides this, most of the resident female students also complain it is due to poor food value supply in their dinning hall. So this is not only the problem of Jessore University of Science and Technology but it also the major problem of other Universities or others educational institution in Bangladesh. As a result it may effect on the social impact of Bangladesh. So, to justify their complains, it is necessary to determined glycemic status as well as BMI of the resident and nonresident

female students of the Jessore University of Science and Technology. Therefore, this study mainly focused on the assessment of glycemic status and BMI of resident & non-resident female student of Jessore University of Science & Technology**.**

METHODS

In this survey and investigation study was used to determine the glycemic status and the effects of BMI on the glycemic status among the resident and non-resident female students of Jessore University of Science and Technology, Bangladesh. The purpose of this study was explained to each participant and after having received her consultation. This study was carried out on the female students (complaint about their health). The complaint students are both the resident and non-resident. A questionnaire was developed to obtained relevant information of the complaint female students. The study was carried out among 20-23years ages groups of 50 resident female students of Sheikh Hasina hall and 50 nonresident female students of Jessore University of Science and Technology those were attending and complaint in the Jessore Science and Technology University Medical Centre's out door from 2013-2014.

A self-administered questionnaire was distributed to the complaint female students, who were likely to be concerned or not about their condition. The doctors those who were involved in the out door of the Jessore University of Science and Technology Medical Centre were advise to investigate the glycemic status & BMI measurement.

Description of sample

A total of 100 complaint female students aged 20-23 years were selected and informed consent was taken in advance. These were subdivided randomly into group 'A' (resident) and group 'B' (nonresident) and these students were attending in the out door in the Medical Centre of Jessore University of Science and Technology, Bangladesh for giving their blood for the determination of glycemic status of female students.

Participants female students were informed about purpose of the study, each female student that is satisfied with participate in the study, signed an informed consent form, they were advised to continue their diet and physical activity habit without any changes during intervention.

Data for the present study were collected through utilizing the following tools: Fasting Blood Glucose was collected on the basis of family status, income, eating pattern, family environment etc. The study was approved by Lab Scan hospital and diagnostic center.

Biochemical analysis (estimation of fasting blood sugar)

Biochemical analysis was done by collection of blood samples, approximately 5 ml of blood samples were taken before breakfast from the vein directly into test tubes for measurements of fasting blood glucose level. The samples were transferred into the laboratory of Lab Scan hospital and diagnostic center, Jessore, Bangladesh. All biochemical measurements were carried out by the same team of laboratory technicians. Prior to implementation of the training program, an official permission was obtained from the supervisors of the selected units. This was intended to facilitate data collection and to explain study purpose. At the beginning of the study, participants were invited to participate in the study. The researcher explained the study purpose and procedures for the randomly selected sample.

Laboratory procedure

Consent was taken for each subject and they were requested to fast overnight. Blood samples were collected by vein puncture from both group of students of the Jessore University of Science and Technology (JUST). The samples were allowed to clot and the serum separated by centrifugation at 3,000 rpm for 10 minutes at room temperature. Serum samples were collected and stored at -4°C until tested. 5 ml of blood was taken in a plain test tube and was separated into plasma and serum by centrifugation. For glucose estimation, 10 µml of blood was placed in a special test-tube containing 1ml glucose reagent and then waited for10 minutes at room temperature, for 5 minutes at 37°C in analyzer machine. Then test-tube that containing serum was inputted into biochemical analyzer (Kobas-311, Germany) for estimated the blood glucose level.

Determination BMI

For the determination of Body Mass Index (BMI), the measurement of the weight and height of the resident and nonresident female students were done by weight measuring machine scale and height measuring machine scale. The Body Mass Index (BMI) is calculated by dividing body weight by the square of height. The normal range of BMI is 18.5-24.99(nutritionally normal).[15] A BMI of 16-18.49 indicates thinness and BMI of 25-40 or above indicates overweight.[15]

Statistical analysis

Data are analyzed as Mean± Standard Deviation (SD), Kolmogorov-Smirnov test was used to determine normality of the data. Data with abnormal distribution were converted to normal distribution by calculating logarithmic ratio. Then data at the end of study were comparing to their own baseline values by Pair t-test. Comparison quantitative and qualitative variables between two groups were performed by Student's t-test and exact fisher test, respectively. SPSS version 18 (IBM

Inc, USA) was used for data statistical analyses. The p<0.05 was considered significance for all variables.

RESULTS

Study was done on 100 female students who were randomly selected. Each group comprised of 50 students. Most of the students were in the age group of 20-23 years. In this study, we compare fasting blood glucose level and BMI of the resident and nonresident female students of Jessore University of Science and Technology, Jessore, Bangladesh. For the determination of the blood glucose level, we consider the effect of some factors such as family status (monthly income, number of family member, educational background of the family members) eating behavior, family history, etc. By studied the socioeconomic status, we observed that around 56% of the studied groups were belonged to middle class (data not shown). In this study we also observed that about 38% of the female students (both the group A and B) family members have been reported to suffering from diabetes mellitus (hyperglycemia) (data not shown). Collected data were tabulated and statistical analyses were performed for the calculation of average and percentage value of the respective parameters. A probability value (P) of <0.05 was considered to be statistically significant (shown in Table 1).

Table 1: Effect of Socio-economical status and BMI on blood glucose level.

|	Lower middle class(monthly income >10,000 taka) %	Middle class (monthly income 11,000-25,000 taka) %	Upper Middle class (monthly income 26,000-40,000 taka)%	Average BMI	Average blood glucose level (hypo) mmol/L	Blood glucose level (hypo) %	Average blood glucose level (normal) mmol/L	Blood Glucose level (normal) %
Resident students (Group A)	16	72	12	21.52	3.05	68	3.98	32
Non-resident students (Group B)	12	40	48	22.34	3.24	60	4.52	40

P<0.05

BMI
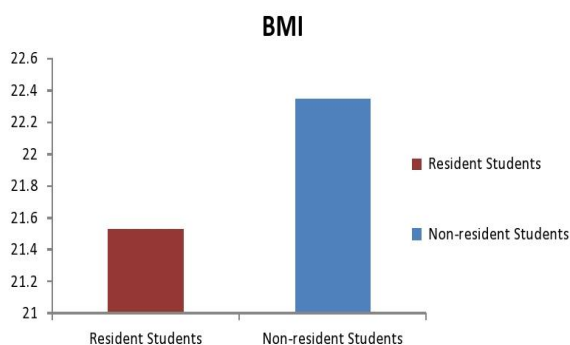
Figure 1: Measurement of BMI of resident (group A) and non-resident (group B) female students. The longest blue bar indicates the BMI (22.34) of non-resident female students and the shortest red bar indicates the BMI (21.52) of resident female students.

To the assessment of the physical factors effecting on the glycemic status of both the resident and nonresident female student, BMI of the both group of female students were measured. In this study we observed the BMI of resident and non-resident female student were 21.52 and 22.34 respectively (shown in Table 1 and Figure 1). Besides the BMI measurement, this study also considers the effect of socio-economical condition on the glycemic status of the both group of students. Table 1 represent that 16%, 72 % and12 % residential female students were belongs to the group of lower middle class, middle class and upper middle class respectively. In case of nonresident students (group B) Table 1 also represent that12 %, 40 % and 48 % students were belongs to the group of lower middle class, middle class and upper middle class respectively.

Figure 2 represent blood glucose level of the group A (resident) and group B (nonresident) students. In group A (resident female students) the average blood glucose level were 3.05 mmol/L (hypoglycemic) and 3.98 mmol/L (normal) respectively. Whereas in group B (nonresident female students) the average blood glucose level were 3.24mmol/L (hypoglycemic) and 4.52 mmol/L (normal) respectively. The p values of both these groups were <0.05. The table 1 and figure 2 also represent that 68% of the group A (resident) female students were exist at hypoglycemic stage but 60% of the group B (nonresident) female students were at hypoglycemic stage. The normal

range of the blood glucose level of the resident and nonresident female students was 32% and 40% respectively.
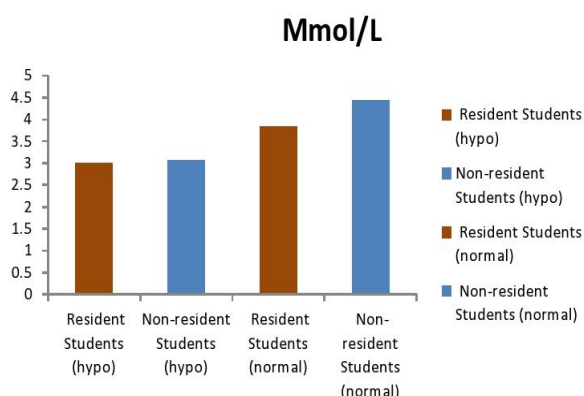
Figure 2: Measurement of Blood glucose level of resident (group A) and non-resident (group B) female students. The red bar indicates the hypoglycemic (3.05 mmol/L) and normal (3.98 mmol/L) fasting blood glucose level of resident (group A) female students and the blue bar indicates the hypoglycemic (3.24 mmol/L) and normal (4.52 mmol/L) fasting blood glucose level of non-resident (group B) female students.

DISCUSSION

In this study, it was mainly focused on the effect of the family status, income, eating pattern and BMI on the glycemic status of both the resident and nonresident female students of Jessore University of Science and Technology. The results obtained in this study represent that the fasting blood glucose level is very low in group A as compare to group B (Table 1 and Figure 2). he hypoglycemic condition was also observed in both groups of students. It was observed that about 68% resident students are in hypoglycemic but 32% students are in normal (Table 1). Whereas in nonresident female student 60% are in hypoglycemic and 40% are in normal but hyperglycemic and acute hyperglycemic effect were totally absent in both group of students.

It is found that the BMI of both group of students are not change significantly (Table 1). Although it has been reported that higher prevalence of hyperglycemia and diabetes among those with higher BMI,[16,17] but the results obtained in this study indicated that BMI does not effect on the glycemic status of both group of female students, as their average BMI are exist in the normal range.

In this study, From Table 1 it was observed that the socio economical status of the residential students were belongs to only (12%) upper middle class but most of the residential students were belonged to lower middle class (16%) and middle class (72%) group, as result it is difficult for them to intake nutritious foods from outside

due to the fixed amount of money provided for them from their family. Therefore the majority of residential students (88%) are only depends on the provided food in the dining hall. Whereas in case of nonresident students, majority of them are belonged to upper middle class (48%) middle class (40%), only (12%) are lower middle class. But most of them are living in their own house, so their eating patterns were good as compare to residential female students. Therefore, most of the nonresident female students are able to intake nutritious foods. As a result the hypoglycemic students are less found in this group (group B) as compare to the resident group (group A) (shown in Table 1). This finding is supported by studies that a higher incidence of diabetes and its complication among people in the lower socio economic classes.[18,19] Therefore, it may be due to the poor quality of nutritious food provide in the dining hall of resident female students.

It has been also reported that lack of healthy diet, high prevalence of infections which may trigger pathogenesis of type I DM is more apparent in children in lower socio economic class and also reported that type 2 DM is more in poor black American due to poor dietary habit.[20]

The result obtained from Table 1, Figure 1 and Figure 2 indicated that there is significant difference of the glycemic status but no significant change of BMI observed in the resident and nonresident female students of Jessore University of science and Technology. In this study, 55% of both nonresident and resident female student have the tendency to dieting for over consciousness of their health. The dieting tendency of the resident student and poor dietary habits are higher than the non-resident students. This result may be concise with Olson 1999 studied.[20] Therefore in this study, we may considered that dieting may be one of the important cause to increasing the tendency of hypoglycemic status of the residential female students as compare to the non-residential female students of Jessore university of Science and technology as well as other of residential female students in Bangladesh.

CONCLUSIONS

One limitation of this study is that the source of information was collected from the interrogation of the participant subject of this study groups. Noting being control the accuracy of this information limits the ability to perform a more complete analysis, such as in the case of collecting the family information (family status, income, eating pattern, family environment) measuring BMI and actual measurement of time for collecting the fasting blood sugar.

Finally, this study suggests that it is important to strengthen the need of awareness of good health care practice, intake good quality nutritious diet, avoid of abnormal dieting practice is prerequisite to maintain

static glycemic status which directly linked to good health.

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