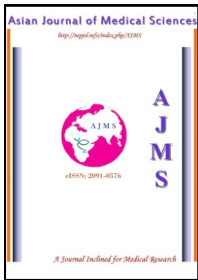


ASIAN JOURNAL OF MEDICAL SCIENCES



Frequency of Type 2 Diabetes mellitus and Impaired Glycemia in a Teaching Hospital of South-Western Nepal

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Abstract

Objective: The aim of this study was to determine the frequency of type 2 diabetes, impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) among patients visiting a tertiary level teaching hospital in south-western Nepal.

Material & Methods: This is a retrospective study conducted among subjects (n=17082) who visited outpatient department of the Universal College of Medical Sciences Teaching Hospital (UCMSTH), Bhairahawa, Nepal for their medical checkup. Data related to age, sex, hospital number and blood glucose concentration of the study subjects were collected from hospital records and analyzed for the frequency study.

Results: The average frequency of type 2 diabetes was found to be 6.1% over a period of five years and it was significantly ($p=0.0232$) higher in males (3.4%) than in females (2.8%). Frequency of IFG and IGT were found to be 2.31% and 2.70% respectively. The frequency of type 2 diabetes, IFG and IGT was significantly higher in males and age group of 51-60 years.

Conclusion: The frequency of type 2 diabetes and impaired glycemia is increasing every year in south-western part of Nepal. We recommend that efforts be made by all the stakeholders to curb this emerging medical problem before it becomes epidemic in the general population.

Key Words: Frequency; Type 2 Diabetes; Impaired Fasting Glucose; Impaired Glucose Tolerance, UCMSTH, South-western Nepal

1. Introduction

Type 2 diabetes mellitus is one of the most common chronic metabolic disorders characterized by hyperglycemia. It occurs due to defects in insulin secretion, insulin action or both and accounts for at least 90% of all cases of diabetes.¹ It is highly prevalent in the elderly and associated with various co-morbidities, such as obesity, hypertension, hyperlipidemia, and cardiovascular disease, which ultimately lead to a condition called 'Metabolic Syndrome'.² The prevalence of type 2 diabetes is increasing at alarming rates both in the developing and the newly industrialized countries of the world. On average, two persons develop diabetes and one person dies from diabetes-related causes in the world every ten

seconds.³ The International Diabetes Federation (IDF) estimates the global prevalence of type 2 diabetes at 6.6% (285 million cases) in 2010 and expects to reach to 7.8% (438 million cases) by 2030.⁴ This rapid increase in the global prevalence is attributed to population growth, aging, urbanization and increasing prevalence of obesity and physical inactivity.⁵ In addition to frank and symptomatic diabetes, there are two different "prediabetes" conditions which are known as impaired fasting glucose (IFG) and impaired glucose tolerance (IGT). These are overlapping and essentially asymptomatic conditions characterized by impaired glycemia and are important known risk factors for type 2 diabetes.^{6,7} Currently, IGT affects 7.9% (344 million cases) of the global population, with most people between 40-59 years of age.⁴

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There has been no nationwide survey to estimate the actual prevalence of diabetes and "prediabetes"

conditions among Nepali population. The currently reported prevalence is either from the hospital and urban area based studies⁸⁻¹³ or extrapolation of the prevalence data from India.¹⁴ Moreover, no survey has been carried out in the south-western part of Nepal to establish the prevalence. This prompted us to conduct a hospital based retrospective study to determine the frequency of type 2 diabetes, IFG and IGT among the patients visiting UCMSTH for their medical check up. It is hoped that this study will be useful in formulating national strategies for diabetes control and conducting nationwide prevalence survey in future.

2. Material and Methods

Patients: This is a retrospective study carried out at the Universal College of Medical Sciences Teaching Hospital (UCMSTH), Bhairahawa, Nepal from January 2006 to December 2010. UCMSTH is a tertiary level hospital situated at south-western part of Nepal and provides health services to people from different districts of Lumbini zone, Nepal and adjoining areas of Uttar Pradesh, India. A total of 17082 outdoor patients (males: 9765 and females: 7317) who visited UCMSTH during the study period for their medical checkup and got their blood glucose estimated were included in this study. The study patients were from both urban and rural populations. The patients diagnosed of having type 1 diabetes were not included in this study. The study protocol was duly approved by the ethical committee of the UCMSTH.

Data Collection: Name, age, sex, hospital number and blood glucose levels (fasting, random and postprandial) of study patients were collected from the hospital records and analyzed for the frequency of type 2 diabetes and impaired glycemia over a period of five years. Blood glucose estimation was carried out in the patient's sera by glucose oxidase/peroxidase method using commercially supplied reagents (Merck) and the concentration of glucose was expressed in milligram/decilitre. Patients were diagnosed of type 2 diabetes mellitus and impaired glycemia on the basis of clinical examination and WHO criteria for diabetes mellitus.¹⁵ IGT was defined as two-hour postprandial values of 140 to 199 mg/dl whereas IFG was defined as fasting serum glucose values of 100 to 125 mg/dl. Only the fasting and postprandial serum glucose concentrations were taken into consideration for the determination of IFG and IGT frequency, respectively.

Statistical Analysis: The information and data retrieved from the hospital record books were entered into the data sheet and then analyzed by GraphPad Prism version 5. Statistical significance was calculated using student's paired t test and p values ≤ 0.05 (two tailed) were considered significant. Results were expressed in terms of mean \pm SD, percentage and numbers and bar diagrams wherever required.

3. Results

Out of the 17082 study subjects who visited UCMSTH with chief complaints of diabetes or other diseases, only 1048 subjects (males: 54.9% (n=575) and females: 45.1% (n=473) were confirmed diagnosed of having type 2 diabetes on the bases of WHO diagnostic criteria and clinical examination. Among these 1048 diabetic patients, 78.4% (n=822) subjects were diagnosed solely on the basis of their fasting (182 ± 55.7 mg/dl) and postprandial (286.4 ± 67.8 mg/dl) serum glucose levels whereas other 21.4% (n=224) subjects were diagnosed on the basis of random serum glucose (287.3 ± 68.9 mg/dl) along with clinical history highly suggestive of type 2 diabetes. The mean age of diagnosed patients ranged between 40 to 66 years in both the sexes. The frequency of type 2 diabetes in 2006, 2007, 2008, 2009 and 2010 were found to be 3.4%, 4.7%, 6.8%, 7.9% and 8.2% respectively and the overall frequency over a period of five years was 6.1%. The total frequency of type 2 diabetes among the patients visiting UCMSTH was significantly higher ($p=0.0232$) in males (3.3%) than in the females (2.8%). Likewise, the overall frequency of IFG and IGT were found to be 2.3% (n=396) and 2.7% (n=462), respectively (Figure 1).

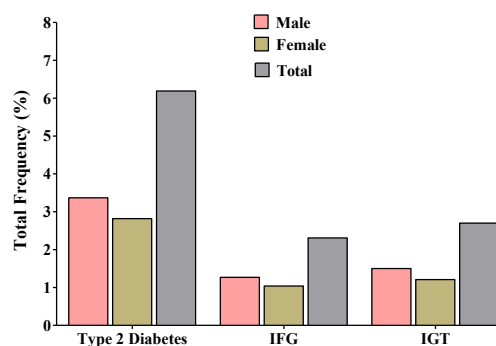


Figure 1: Total and sex wise frequency of type 2 diabetes, IFG and IGT among the study subjects

Frequency of IFG was slightly higher in males [1.3% (n=217)] than in females [1.0% (n=179)]. Likewise, the frequency of IGT in males was 1.5% (n=255) whereas it was 1.2% (n=207) in females (Figure 1).

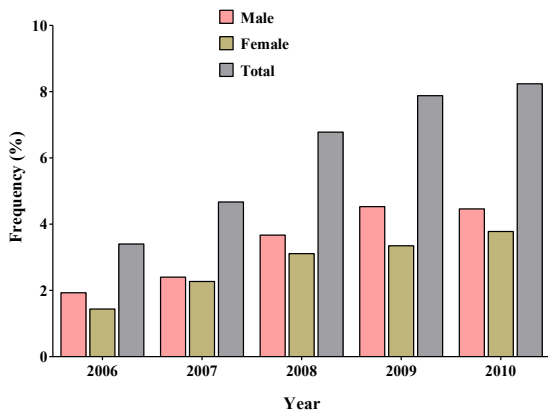


Figure-2: The year wise and sex wise frequency of type 2 diabetes mellitus in the study subjects

However, these differences in frequency between males and females were not statistically significant for both IFG ($p=0.118$) and IGT ($p=0.1435$). The frequency of type 2 diabetes was found to be increasing every year by an average factor of 1.25 (Figure 2).

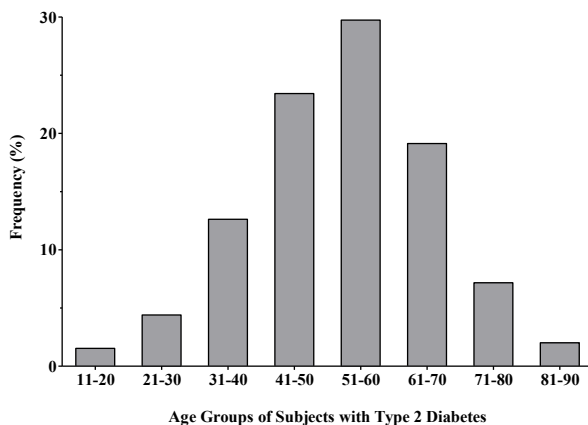


Figure-3: Age wise distribution of frequency of type 2 diabetes among the study subjects

Age wise analysis of the data revealed that the frequency of type 2 diabetes was relatively higher in the age group of 51-60 years (Figure 3).

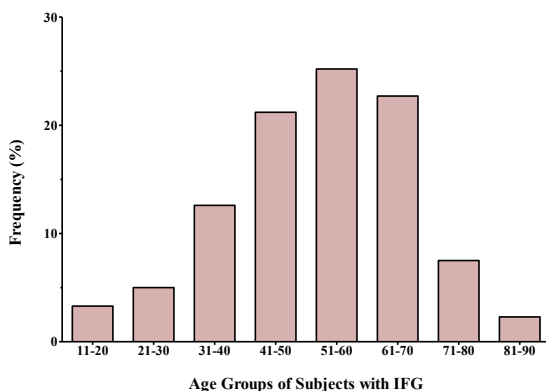


Figure 4: Age wise distribution of frequency of IFG among the study subjects

A similar tendency was also observed in case of IFG (Figure 4) and IGT (Figure 5). Here again, the age group of people who were mostly affected was 51-60 years and the frequency was higher in males than in females.

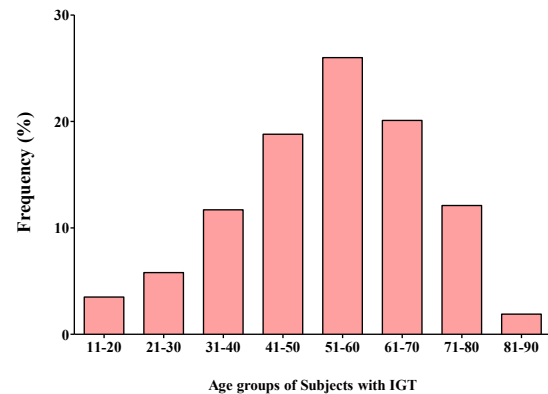


Figure-5: Age wise distribution of frequency of IGT among the study subjects

4. Discussion

This study includes subjects from both rural and urban population and reports for the first time the frequency of type 2 diabetes and “prediabetes” conditions from a teaching hospital in south-western part of Nepal. The frequency of type 2 diabetes among the study subjects was found to be 6.1 % which is in agreement with the current global prevalence of diabetes mellitus.⁴ On the other hand, the frequency of IFG and IGT which were found to be 2.3% and 2.7% respectively are much lower than that reported for the global population in 2010 and other population within Nepal.^{4,11} These discrepancies clearly indicate that regional variations do exist in the prevalence of type 2 diabetes and intermediate hyperglycemia within Nepal. Moreover, lower frequency of IFG might also be due to the fact that we have chosen WHO guideline¹⁵ rather than American Diabetes Association’s guideline¹⁷ for the identification of subjects with IFG. According to WHO guideline, the lower cut-off value for IFG is 110mg/dl whereas for ADA it is 100 mg/dl. The current study also analyses the changing trends in frequency of type 2 diabetes at UCMSTH over a period of five years. The type 2 diabetes frequency was found to increase on average by 25% each year, suggesting a dramatic rise in type 2 diabetes cases in Nepal. Beside type 2 diabetes, there were many cases of “pre-diabetes” having IFG and IGT which are at relatively high risk for development of type 2 diabetes later in life. In the absence of pregnancy, IFG and IGT are not clinical entities in their own right but rather risk factors for future diabetes as well as cardiovascular disease.

Medical nutrition therapy aimed at producing 5-10% loss of body weight, regular physical exercise, and certain pharmacological agents have been variably demonstrated to prevent or delay the development of type 2 diabetes in people with IGT. In this light, detection of IGT or IFG in the clinic can lead to considerable efforts to prevent their progression to type 2 diabetes¹⁸ Furthermore, many individuals with IGT are euglycemic in their daily lives.¹⁷ Considering this factor and many other undiagnosed cases, the actual frequency is likely to be still higher than the reported level. In developed countries further urbanization and changes in the life-style of the people are less likely. In such countries, ageing and rise in population are the major factors that contribute to slight increase in future prevalence of type 2 diabetes. However, in developing countries like Nepal, rapid urbanization and changes in life styles that adversely affect carbohydrates and fat metabolism are causing a large increase in the number of type 2 diabetic patients. This is the reason why the prevalence of type 2 diabetes in Nepalese urban population is second highest after India among the various Asian populations.¹⁹ We found a significantly higher frequency of type 2 diabetes in males than in females, with a mean value of 3.3% against 2.8%. This finding is not surprising in the context of the social system where females are expected to take up a major share of the laborious chores. This difference might also arise because males are more likely to come to the hospital at earlier stage of discomfort or disease in the generally not so affluent population. Similar findings have also been reported from studies conducted in other Nepalese populations.⁸⁻¹⁰

This gradual increase in the frequency of type 2 diabetes over a period of five years seems to be due to rapidly increasing economies and adoption of western life style in Nepal. The increasing frequency of IFG and IGT is likely to contribute to increase the prevalence of type 2 diabetes in near future too. It is therefore necessary to create public awareness among the Nepalese population about the possible risk of sedentary lifestyle, obesity and excess consumption of energy rich food in order to prevent the drastic increase in diabetes prevalence in this part of the country.

5. Conclusion

Our study highlights the increasing frequency of type 2 diabetes and impaired glycemia in a Teaching Hospital of south-western part of Nepal. Results of this survey do

not necessarily reflect the countrywide prevalence of type 2 diabetes and impaired glycemia as sampling was mainly confined to south western part of Nepal and hospital based data were taken into considerations. However, we hope this study will be an important milestone in assessing the countrywide prevalence of diabetes mellitus in Nepal, and serve as a basis to improve diabetes monitoring and control strategies by the health authorities of Nepal.

Acknowledgement: The authors would like to thank Dr V. K. Pahwa, Principal and CEO of Universal College of Medical Science, Bhairahawa, Nepal for his constant encouragement and suggestion to carry out this study. Authors are also thankful to all the staff members of clinical biochemistry laboratory for their help in analysis of blood samples and data management for this study.

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