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A cross sectional screen for diabetes correlating physical activity and blood glucose levels

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ABSTRACT

Background: Diabetes, a chronic disease, is presently a rapidly growing epidemic globally. The risk of diabetes type 2 is greatly increasing with change in lifestyle factors, urbanization, high blood pressure, overweight or obesity, physical inactivity and poor diet. It's one of the reasons for premature death and disability and the number of cases are drastically increasing every year.

Methods: 81 subjects above 18 years of age were considered for the screening. Random blood glucose levels were tested using the Thyrocare Sugar scan glucometer strips. Physical activity data was collected using a questionnaire. Based on the extent of physical activity, the subjects we grouped into three different categories. Data was analyzed and expressed using basic statistical tools in MS Excel 2007.

Results: 6.17% of the rural population of Kendri, with mean age 47.4 years, had undiagnosed diabetes. The mean blood glucose level in diabetes positive cases was 279.8 mg/dL. A correlation of random blood glucose levels of the subjects with the extent of their physical activity was observed, where a decrease in physical activity/increase in physical inactivity showed an increase in blood glucose levels.

Conclusions: From our study we conclude that undiagnosed diabetes is prevalent amongst the rural populations of Kendri, Chhattisgarh and low physical activity correlated with an increase of blood glucose levels, suggesting an urgent need to create health awareness, with emphasis on increase in physical activity, literacy and diabetes management, obesity, specifically among the illiterate and underprivileged rural populations.

Keywords: Diabetes mellitus type 2, Screening, Blood glucose level, Physical activity

INTRODUCTION

Diabetes mellitus is a chronic progressive disease characterized by elevated levels of blood glucose. It is one of the most common chronic non-communicable diseases globally. The number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014. Diabetes and high blood glucose caused 1.5 million and 2.2 million deaths in the year 2012, respectively. Diabetes is recognized as an important cause of premature death and disability. It is one of four priority

non-communicable diseases (NCDs) targeted by world leaders in the 2011.²

Diabetes in India, is gaining the status of a potential epidemic with the number of growing cases of diabetes increasing from 50.8 million in 2010 to a 65.1 million.³ In 2000, India (31.7million) had the highest number diabetes mellitus cases followed by China and United States with 20.8 million and 17.7 million cases respectively. The prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million

in 2030 with a maximum increase in India. It is predicted that by 2030 diabetes mellitus may afflict up to 79.4 million individuals in India. 4.5

Type 2 diabetes results from the body's ineffective use of insulin, accounts for the vast majority of people with diabetes around the world. It is a leading cause for death in the high income countries and an epidemic in the lower and middle income countries, which has evolved due to rapid cultural and social changes, ageing populations, increasing urbanization, dietary changes, reduced physical activity and other unhealthy lifestyle and behavioral patterns. 6 Sedentary lifestyles, lower physical activity, and lower educational levels were found to be associated with type 2 diabetes among the barber group of the Djerba island. Overweight and obesity, together with physical inactivity, is an outcome of rapid urbanization, which is estimated to cause a large proportion of the global diabetes burden.8 Excess body fat, which is a summary measure of the several aspects of diet and physical activity, is a strongest risk factor and largest relative risk for type 2 diabetes. It has been suggested that regular physical activity reduces the risk of diabetes and raised blood glucose, and is an important contributor to overall energy balance, weight control and obesity prevention-all risk exposures linked to future diabetes prevalence.9

Data by Wild et al shows that prevalence of diabetes in rural populations is one-quarter that of urban population for India and other Indian sub-continent countries such as Bangladesh, Nepal, Bhutan and Sri Lanka. 4,10,11 Our study has earlier reported a prevalence of 10.8% of type 2 diabetes among the rural population, where the people are unaware that they harbor this disease. 12 In India the urban populations have access to reliable screening methods and anti-diabetic-medications, and such health benefits are not often available to the rural patients resulting in disproportionate allocation of health resources between urban and rural areas, this along with higher illiteracy rates and lack of awareness and diabetes management in the rural areas could be a reason for underestimation in the number of diabetes cases in the rural population. Hence, estimating the prevalence among the rural populations, and awareness of proper management of diabetes along with health education could benefit public health and reduce diabetic burden upon the society. The aim of the study was to correlate the burden of diabetes mellitus type 2 and the extent of physical activity in a rural setting, the village of Kendri, Nava Raipur, Chhattisgarh, India.

METHODS

A cross sectional study was conducted on the rural population of Kendri village, Raipur, Chhattisgarh on 10th March, 2019 to investigate the prevalence of type 2 diabetes and its association with physical activity in a typical rural background. The data was collected during the camp and was analyzed further.

Permission to conduct the screen was provided by the members of village Panchayat of Kendri village and the Institutional Ethics Committee of ITM University. Public health experts, social workers and students were involved in the screening. Information regarding the screening camp was provided to all the villagers through different grass rout level workers. A one day free screening camp was conducted to evaluate the burden of type 2 diabetes in this population and assess its correlation with physical activity. Subjects were included in the study irrespective of their gender, only individuals above the age of 18 years were considered. All subjects were native of the village and living in the village for at least five or more years to avoid any selection bias. The purpose of the study was explained to the people in their local language prior to the screening. The random glucose levels of 81 subjects were estimated and data regarding their physical activity was filled in a questionnaire. The random blood glucose levels of the subjects were tested using the Thyrocare Sugar scan glucometer strips (HMD BioMedical Inc., Hsinchu, Taiwan) in accordance with the WHO guidelines. Routinely employed standard kits were used for the testing. The kits were tested among the staff members before applying to the subjects. A first aid box, emergency medicines and glucose biscuits were provided during the screening camp. Data were collected, entered and tabulated in a data sheet. Data were analyzed and presented by using basic statistical tools in MS Excel 2007.

The development of diabetes was defined as a fasting blood glucose concentration of >126 mg/dl or a postload/postprandial blood glucose concentration of >200 mg/dl, based on the WHO criteria or a casual/random plasma glucose (PG) >11.1 mmol/l (200 mg/dl) also indicating diabetes type 2 or HbA1c (which reflects average plasma glucose over the previous 8 to 12 weeks) of 6.5% recommended as the cut off point for diagnosing diabetes. ¹³⁻¹⁶

RESULTS

Among the 81 screened subjects 68% were male and 32% were female (Figure 1). 6.17% of the subjects tested positive for diabetes mellitus type 2 with their random blood glucose levels above 200 mg/dl or 11.1 mmol/l. Among the 6.17% positive cases, 3.7% were males and 2.4% were females (Figure 2).

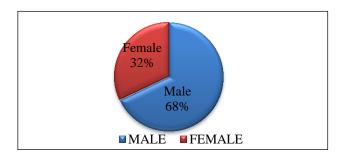


Figure 1: Gender wise distribution of the subjects.

The mean age of positive cases was 47.4 years and their mean glucose level was estimated to be 279.8 mg/dl. Based on data from the questionnaire the subjects were categorized on the extent of physical activity into 3 groups, low physical activity group (LPA) which included only walking along with daily chores, medium physical activity group (MPA) with at least two physical activities apart from their daily chores and high physical activity group (HPA) which included subjects with three and more physical activities apart from their daily chores. The criteria for categorization of physical activity was set considering the disproportionate allocation of health benefits, lack of advance recreational facilities and poor economic and literacy conditions in the rural areas. The blood glucose levels of the subjects were correlated with the extent of their physical activity, as an outcome we observe a subtle decrease in trend of means glucose level with increase in physical activity. The LPA group depicted a mean glucose level of 126.92 mg/dl, the medium and high physical activity groups had blood glucose levels of, 118.16 mg/dl and 109.77 mg/dl (Figure 3) respectively.

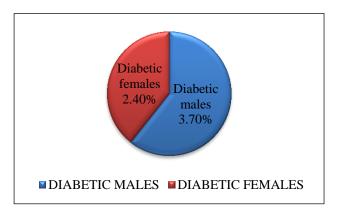


Figure 2: Gender wise percentage of positive diabetes cases.

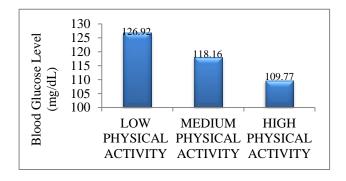


Figure 3: Correlation of the extent of physical activity with averaged blood glucose level.

DISCUSSION

Diabetes is becoming a very common chronic disorder especially in the developing countries, due to rapid urbanization, lack of health awareness, improper diabetes management, and poor health care facilities. According to the International Diabetes Federation, around 366 million people globally are currently estimated to have diabetes, of which 80% live in low and middle income countries and about 50% of the diabetes cases remain undiagnosed. ¹⁷⁻¹⁹ In our case none of the positive cases were aware that they were harboring diabetes.

Previous studies have reported a prevalence of diabetes mellitus between 3.0% to 8.3% in rural populations of the different regions of India. Also, earlier data reports a prevalence of 10.8% and 8.21% prevalence of diabetes in rural Chhattisgarh and Mysore. The prevalence numbers in the rural population could under estimated because of the diagnostic gap that exists due to the fall back in health care systems. It has also be shown that occupation is significantly associated with the prevalence of DM.²⁰ A rising trend in the prevalence of diabetes was observed among unemployed and retired subjects as compared to manual laborers. Lower prevalence of diabetes mellitus was found among laborers as compared to those in other occupations; similar findings were reported by Ramachandran et al.²¹ The reason for this could be that the extent of physical activity of the laborers is much more higher than the other occupations. Our data also demonstrates a decrease in the trend of blood glucose level with increase in physical activity. Our data indicates that adaptation to rapid urbanizations, change in healthy dietary habits and decrease in physical activity are a main cause for the increase in the blood sugar levels. Moreover, the poor health care systems, socio-economic conditions and illiteracy rates among the rural population are the main reasons for unidentified cases of diabetes in rural populations.

The WHO recommends physical activity for different age groups, at least 60 minutes of moderate-to vigorous-intensity physical activity daily for children and youth aged 5-17 years, at least 150 minutes of moderate-intensity aerobic physical activity (for example brisk walking, jogging, gardening) spread throughout the week, or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of moderate and vigorous-intensity activity for adults aged 18-64 years. Since diabetes is highly prevalent in the age group of 30-70 years awareness of physical activity should me created among the population that would help control the rate of diabetes and help in its management.

Knowledge of diabetes and its complication management is a key component in controlling diabetes and hence awareness of physical exercise and healthy dietary habits among the rural populations is extremely necessary.

CONCLUSION

In our study we have found that undiagnosed diabetes is prevalent amongst the rural populations of Kendri, Chhattisgarh. It was also observed that low physical activity is correlated with an increase of blood glucose levels. There is an urgent need for a bigger study at multiple locations and to create health awareness. Further the emphasis on increase in physical activity, diabetes management, obesity, specifically among the illiterate and underprivileged rural populations has to be done.

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Institutional Ethics Committee

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