

A CROSS-SECTIONAL STUDY OF TYPE 2 DIABETES MELLITUS PREVALENCE AMONG THE INDIAN RURAL POPULACE IN BIHAR.

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ABSTRACT

Background:

Diabetes is difficult to manage in resource-poor countries like India, where many people are diagnosed late and have complications. This study seeks to increase diabetes research in rural India. The main goal of this study is to ascertain the incidence of Type 2 diabetes mellitus among rural populations in Bihar, India, who are 25 years of age and older.

Methods:

During the study, health camps were held and went door-to-door to determine rural diabetes prevalence. Fasting capillary blood glucose was tested with a glucose meter. All adults then consumed 75 g of glucose dissolved in 200 milliliters of water in five minutes. Two hours after intake, post-load capillary blood glucose was measured. Diabetes was confirmed by collecting blood samples in a fluorine vacutainer, with fasting plasma glucose levels ≥ 126 mg/dl and/or 2-hour postprandial glucose levels ≥ 200 mg/dl as diagnostic criteria.

Results:

According to the survey, 7.03% of rural residents had Type 2 diabetes; females had a greater prevalence of the disease (56%) than males (44%). Diabetes affected 28% of participants over the age of 70, compared to 11% of those in the 25–39 age range. Furthermore, 34.77% of diabetics were newly diagnosed cases, while 8.04% of participants had a prediabetic diagnosis.

Conclusions:

This study shows an elevated incidence of Type 2 diabetes in rural Bihar, India. Rural areas need comprehensive early diagnosis, care, and diabetes prevention education to meet this growing health burden.

Recommendation:

Early detection, management, and preventative education are crucial in rural western Uttar Pradesh, where Type 2 diabetes is common. Community-based awareness initiatives and accessible healthcare can lessen diabetes complications in the region.

Keywords: Prediabetes, Blood glucose, Type 2 diabetes mellitus, Rural India

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INTRODUCTION

A range of metabolic conditions collectively referred to as diabetes mellitus (DM) are marked by hyperglycemia resulting from dysregulation of insulin production, insulin sensitivity, or both [1]. The etiology of diabetes can be traced back to archaic Indian manuscripts that denoted the

ailment as "Madhumeha," which aligns with contemporary nomenclature of "Diabetes mellitus" [2]. In recent years, there has been a significant increase in the prevalence of diabetes in India. The Indian Council of Medical Research India Diabetes Study (ICMR-INDIAB study) reported a total of 62.4 million individuals diagnosed with diabetes in 2011. It is projected that this number will rise to 101.2 million by the year 2030 [3]. The South-East Asia Region,

encompassing India, is home to approximately 20% of the global adult population affected by diabetes. The current prevalence of diabetes in India is reported to be 8.8% among the adult population, affecting approximately 78.1 million individuals. Projections indicate a significant increase in the number of affected individuals, with estimates suggesting a surge to 123 million by the year 2040 [4]. It is a matter of concern that a significant proportion exceeding fifty percent of individuals afflicted with diabetes in India continue to remain undiagnosed, thereby indicating a lack of awareness regarding their condition. Furthermore, among those individuals who are cognizant of their diabetic status, the management of this chronic ailment is found to be suboptimal. The aforementioned distressing situation is further compounded by the predominantly rural demographic (70%) in India, wherein the availability of diabetes screening is restricted, resulting in a significant prevalence of undiagnosed cases, primarily of Type 2 diabetes [5]. Timely identification and intervention are of utmost importance in order to minimize potential complications, underscoring the pressing necessity for proactive and opportunistic screening endeavors targeting diabetes.

The present study aims to assess the incidence of Type 2 diabetes in rural regions of Bihar, India, thereby addressing a significant void in the current body of research. Although numerous investigations have focused on the prevalence of this condition in urban settings, there remains a dearth of knowledge regarding its occurrence in rural areas.

METHODOLOGY

Study design:

A comprehensive cross-sectional study

Study setting:

The current investigation was carried out in rural regions around the Darbhanga Medical College, Darbhanga, Bihar for duration of March 2022-Januray 2023.

Participants:

A total of 141 individuals had their diabetes status checked.

Inclusion criteria:

The patient's age exceeds 25 years. A fasting period of ten hours preceding the screening process is recommended. The individual expresses their willingness to provide informed consent.

Exclusion criteria:

Hyperglycaemia may arise from various secondary factors, including but not limited to pregnancy, administration of corticosteroids or other pharmacotherapeutic agents associated with hyperglycaemia, the presence of chronic calcific pancreatitis, or the manifestation of any other organic pathology that induces hyperglycaemia. The present study aims to elucidate the documented instances of type 1 diabetes mellitus. Individuals residing in metropolitan regions.

Study size:

Following the application of stringent inclusion and exclusion criteria, the final study cohort comprised 141 participants.

Variables

Variables included demographic details, anthropometric measurements, and biochemical profile.

Data collection and analysis:

The recruitment of participants was conducted through the utilization of the health camp methodology. Consultation was conducted with local panchayats and village heads to facilitate optimal engagement. Following the acquisition of written or verbal informed consent, the participants were assigned a distinct study identification number to ensure their de-identification during the data collection process. The participants subsequently proceeded to complete a concise survey form, encompassing fundamental demographic details such as residential address, age, and gender.

To ensure the standardization of blood glucose measurements, participants were instructed to present themselves for the survey in the early morning, following a period of fasting lasting between 8 and 12 hours. The measurement of fasting capillary blood glucose was initially conducted utilizing a glucose meter. The adult participants were administered a dose of 75 grams of glucose, which was dissolved in 250-300 milliliters of water. This solution was consumed within a timeframe of up to 5 minutes. Subsequently, the capillary blood glucose levels were measured at the 2-hour mark following the glucose load.

The individuals identified as having a diagnosis of diabetes were subsequently requested to attend our institute for subsequent assessment and evaluation. The individual's diabetic condition was verified through the collection of blood samples to assess fasting and postprandial blood sugar

levels, as well as HbA1c. These samples were subsequently analyzed in the biochemistry laboratory using the kit-based GOD-POD method and immunoturbidimetric methods, respectively.

Bias:

When the study originally began, there was a potential for bias, but we were able to prevent that by providing all participants with the same material and concealing the group assignment from the nurses who took the data.

Statistical analysis:

The Statistical Package for Social Sciences, version 21.0, was used to perform the statistical analysis of the data. While mean and standard deviation (SD) were used to describe continuous variables, absolute numbers and percentages were used to represent categorical variables.

Ethical considerations:

The Ethics Committee approved the study procedure, and all subjects gave written informed permission.

Table 1: Baseline characteristics of diabetic patients

		No. of diabetics	Percentage of total diabetics
Age (in years)			
25-39		15	11%
40-49		23	16%
50-59		20	14%
60-69		24	17%
≥70		40	28%
Sex			
Male	Diabetic	62	44%
	Prediabetic	54	38%
Female	Diabetic	79	56%
	Prediabetic	87	62%

Table 2: Patients with diabetes: mean age, anthropometric measurements, and biochemical profile.

Characteristics	Male	Female	Total
Age	50.62 ± 11.3	50.83 ± 10.74	50.72 ± 11.36
Duration of diabetes	3.59 ± 1.3	3.23 ± 1.59	2.97 ± 1.5
BMI	24.27 ± 3.08	24.19 ± 4.30	24.23 ± 3.2
FBS	195.63 ± 76.79	189.84 ± 60.32	191.74 ± 69.02
PPBS	320.70 ± 96.06	320.01 ± 97.90	320.85 ± 96.86
HbA1C	8.16 ± 1.1	7.98 ± 1.2	8.07 ± 1.15

BMI= Body mass index, FBS= Fasting blood sugar, PPBS= Post prandial blood sugar, HbA1c= Glycated haemoglobin.

RESULTS

The table presents a breakdown of the diabetic population based on age groups and gender. Among the total number of diabetics, the highest percentage falls within the age group 70 and above constituted 28% of the diabetic cases. The 40-49 years age group follows, with 16% of the diabetics, while the 50-59 years age group accounts for 14%. In the 60-69 years age category, 17% of diabetics were identified, and individuals aged of 25-39 years, comprising 11% of the diabetic cases.

Regarding gender distribution, the majority of diabetics were female, representing 56% of the total diabetic population and 62% of pre-diabetic population. Conversely, male diabetics made up 44% of the overall cases in diabetic and 38% in prediabetic cases. This breakdown by age and gender provides valuable insights into the distribution of diabetes within the studied population, highlighting the varying prevalence across different age groups and between males and females.

34.77% of the participants in the study received a new diagnosis of diabetes, whereas 63.23% had diabetes before to the trial. The population with diabetes had a mean age of

50.72 years and an average duration of 3.87 years. The mean FBS, PPBS, and HBA1c levels were 191.74 mg/dl, 320.85 mg/dl, and 8.07, respectively, while the average BMI was measured at 24.23 kg/m². Notably, the average features of the male and female participants were comparable, with the exception of the length of diabetes, which was lower in the case of the ladies (3.2 years) than in the case of the boys (3.59 years) (Table 2).

DISCUSSION

In the present study, out of the 141 participants, 7.03% were diagnosed with diabetes. The majority of people with diabetes were female, making up 56% of those with the disease overall and 62% of those without it. On the other hand, 38% of prediabetic cases and 44% of total diabetic cases were male. The higher prevalence among females could be attributed to factors such as limited access to healthcare, lower education levels, and less proactive healthcare-seeking behavior. This trend aligns with findings from Ahmad *et al.*, [6] which also observed a higher prevalence of diabetes among females.

Comparing the findings to large metropolitan cities in India, where diabetes prevalence among adults ranges from 8-18%, the study reveals a prevalence of 4-10% in rural areas. Some studies have even reported rates as high as 13.2% in rural regions, signifying a rapid increase in diabetes prevalence in these areas [7, 8].

Additionally, the study found a prevalence of 10.3% for prediabetes, which is in line with the ICMR-INDIAB study's [3] rural prevalence rates for various Indian states. Age-wise, it was observed that with 11% of cases were found in people 70 years of age and beyond, accounts for the largest percentage of all diabetes cases. Following, the 40–49 age group accounts for 16% of diabetes, while the 50–59 age group accounts for 14%. 17% of diabetes cases were found in the 60–69 age group, while 28% of all diabetic cases, the age range of 25 to 39. These figures closely resemble the findings of Shrivastava S and Ghorpade, [9] who studied a rural population in Pondicherry.

Furthermore, the study identified a high prevalence of newly diagnosed diabetics, accounting for 34.77% of the total diabetic cases or 2.67% of the study population. This finding echoes those of Vijaykumar G *et al.* [10] and Little *et al.*, [11] underscoring the need for improved healthcare-seeking behavior among the study population due to the substantial number of undiagnosed diabetes cases.

Generalizability:

The study's generalizability is supported by a comprehensive examination of diabetes prevalence and related factors among 141 participants, with 7.03% diagnosed with diabetes. The higher prevalence of diabetes among females aligns with previous research, emphasizing the importance of addressing healthcare disparities and encouraging proactive healthcare-seeking behavior in this demographic. Furthermore, the study's findings in rural areas, with diabetes prevalence ranging from 4-10%, reflect trends observed in large metropolitan cities in India, indicating a significant health concern in these regions. Age-wise, the study identifies various age groups with diabetes, with the highest percentage among individuals aged 70 years and above, consistent with similar studies in rural populations. Additionally, the substantial proportion of newly diagnosed diabetics underscores the necessity for improved healthcare access and awareness in the studied population. These findings contribute to a broader understanding of diabetes prevalence and its associated factors, with implications for healthcare interventions in similar settings.

CONCLUSION

In conclusion, rural Bihar, India, has high diabetes rates. Nearly 18% of prediabetics are at risk of elevated blood sugar. Early identification and treatment are crucial for these patients, who may develop problems. More studies are needed to estimate rural diabetes prevalence to provide a complete picture of Indian diabetes. The study also discovered that 34% of diabetics were recently diagnosed, suggesting that many had already developed problems. This emphasizes the essential need for enhanced public and diabetic awareness to avoid and treat diabetes and its complications.

Limitations:

The study is subject to certain limitations, primarily stemming from the relatively small size of the sample population that was included in the study. The generalizability of the study's findings to a broader population is limited. Moreover, the absence of a comparative cohort also presents a constraint on the findings of this study.

Recommendation:

Given the high incidence of Type 2 diabetes in rural Bihar, it is crucial to implement proactive healthcare initiatives focused on early detection, management, and preventive education. Community-based awareness programs and accessible healthcare services can significantly contribute to

addressing this pressing public health issue and reducing the burden of diabetes-related complications in the region.

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List of abbreviation:

DM- diabetes mellitus
T2DM- Type 2 diabetes mellitus
ICMR-INDIAB- Indian Council of Medical Research India Diabetes Study
SD- Standard deviation
BMI- Body mass index
FBS- Fasting blood sugar
PPBS- Post prandial blood sugar
HbA1c- Glycated haemoglobin

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Conflict of interest:

The authors have no competing interests to declare.

REFERENCES

1. Classification of diabetes mellitus and other categories of glucose intolerance. In: Alberti K, Zimmet P, De Fronzo R, eds. International Textbook of Diabetes Mellitus. Chichester: John Wiley and Sons Ltd; 1997:9-23.

2. Tipton MC. Susruta of India, an unrecognised contributor to the history of exercise physiology. *J Appl Physiol*. 2008;108:1553-6.
3. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, et al. Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: Phase I results of the Indian Council of Medical Research India Diabetes (ICMR-INDIAB) study. *Diabetologia*. 2011;54:3022-7.
4. International Diabetes Federation. IDF Diabetes Atlas, 7th edition. Brussels, Belgium: International Diabetes Federation. 2015;7:55-63.
5. Census of India. Rural urban distribution of population. office of the registrar general and census commissioner, India. Available from: http://censusindia.gov.in/2011-prov-results/paper2/data_files/india/Rural_Urban_2011.pdf. (Accessed on 7 nov 2016).
6. Ahmad J, Masoodi MA, Mohd A, Rahid R, Ahmad R, Ahmad A, et al. Prevalence of diabetes mellitus and its associated risk factor in age group of 20 years and above in Kashmir, India. *AI Ameen J Med Sci*. 2011;4(1):38-44.
7. Chow CK, Raju PK, Raju R, Reddy KS, Cardona M, Celermajer DS, et al. The prevalence and management of diabetes in rural India. *Dia Care*. 2006;29:1717-8.
8. Deo SS, Zantye A, Mokal R, Mithbawkar S, Rane S. To identify the risk factors for high prevalence of diabetes and impaired glucose tolerance in Indian rural population. *Int J Diab Dev Countries*. 2006;26:19-23.
9. Shrivastava S, Ghorpade A. (2014). High prevalence of type 2 diabetes mellitus and its risk factors among the rural population of Pondicherry, South India. *J Res Health Sci*. 2014;14(4):258-63
10. Vijayakumar G, Arun R, Kutty VR. High prevalence of type 2 diabetes mellitus and other metabolic disorders in rural Central Kerala. *J Assoc Physic India*. 2009;57:563-7.
11. Little M, Humphries S, Patel K, Dodd W, Dewey C. Factors associated with glucose tolerance, pre-diabetes, and type 2 diabetes in a rural community of south India: a cross-sectional study. *Diabetol Metab Syndr*. 2016;8(21):3-11.

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