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Original Research Article

Study of Risk Factors of Undiagnosed Diabetes Mellitus in Telangana Population

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Abstract:

Background: Diabetes mellitus is the fastest-growing health problem globally, but half of the type II DMs is undiagnosed due to little knowledge about glycemic status and their signs and symptoms.

Method: Out of 318 (three hundred eighteen) patients studied, 98 were undiagnosed. Diabetes, Blood samples were collected in a fasting state for plasma glucose and lipids including total cholesterol, HDL, and triglycerides. Classification of known and unknown diabetes fasting plasma glucose value 126 mg/dl (> 7.0 mm o/l) but who are unaware of this glycolic status was defined as undiagnosed diabetes.

Results: In undiagnosed diabetes, fasting glucose (mg/dl) was 162 (±50), with the least family history, elevated lipid profile, and hypertension. Having more specificity and a more likely ratio of risk factors, elevated metabolic syndrome was also observed in undiagnosed diabetes.

Conclusion: Due to elevated glycemic and lipid profile parameters in undiagnosed diabetes, they are more prone to CVD risk factors.

Keywords: Glycemic status, fasting plasma glucose, lipid profile, enzymatic calorimetric GOD-PAP method.

Introduction

The prevalence of diabetes is swiftly increasing around the globe at an alarming rate. According to the International Federation of Diabetes, 415 million adults around the world are suffering from diabetes. It is estimated that the number will reach around 642 million by 2040 [1]. The inevitable lifestyle changes brought about by rapid industrialization and urbanization in Indian society are thought to be the cause of this epidemic, and the solutions to this problem still remain elusive and expensive [2,3].

Due to the busy schedule of employment, most of the population is unaware of their glycemic status and the risk of cardio-vascular diseases like IHD, MI, haemiparasis, tropical ulcers, gangrene, etc. [4].

Hence, an attempt was made to study the patients who have signs and symptoms of diabetes mellitus, and their cardiovascular profile was ruled out as a prognostic value for risk factors.

Material and Method

318 adult patients regularly visited the department of general medicine at the MediCiti Institute of Medical Sciences in Ghanpur (village), Medchal (mandal), and Medchal Malkajgiri district, Hyderabad-501401, Telangana).

Inclusive Criteria: The patient aged between 35 to 64 years, having signs and symptoms of diabetic mellitus (although many patients were undiagnosed), gave consent in writing to undergo the present study were selected for study.

Exclusion Criteria: Juvenile diabetes, patients with thyroid disorders and patients associated with mental illness were excluded from the study.

Method

Blood samples were collected in a fasting state for plasma glucose and lipids, including total cholesterol, high-density lipoprotein cholesterol (HDL), and triglycerides. Blood glucose measurement was performed in the plasma by the enzymatic calorimetric GODPAD method using Boheringer-Mannheim kits. Cholesterol by (HOD-PAP method).

Triglyceride by GPOD-PAP method and HDL by the precipitation method (phosphotung tung state / mg). The presence of diabetes was defined as a

fasting plasma glucose value of 126 mg/dl (≥ 7.0 mm 01/l) or a medical history of receiving treatment for diabetes. Undiagnosed diabetes was defined as those who had fasting blood glucose 126 mg/dl (≤ 7.0 mm 01/l) but were not aware of their glycemic status. Only fasting glucose criteria were used to define diabetes. Optimal blood pressure, pre-hypertension and hypertension, and abdominal obesity were defined as waist circumference thresholds.

The clinical examination included blood sampling and an electrocardiogram to rule out vascular disease and its risk factors. Past medical history, risk behaviors, and family history are relevant to the study of CVD risk factors.

The duration of the study was from February 2023 to January 2024.

Statistical analysis: The characteristics of diagnosed and undiagnosed type II diabetes mean values of the risk score using a threshold score >16 for prediction of known diabetes and un-diabetes were compared with the mean value (±SD), cardiovascular factors score was evaluated as true positive and false positive in undiagnosed diabetes patients. The statistical analysis was carried out in SPSS software. The ratio of males and females was 1:1.

Observation and Results

Table 1: Comparison of characteristics of diagnosed and undiagnosed diabetes patients

- Percentage of women was 50% in know diabetes and 50% in unknown diabetes
- Mean age ±SD (years) was 50 (± 6) in unknown diabetes
- Mean body mass index (kg/m2): 52 (±6) in known, 49 (±8) in unknown diabetes
- Mean ±SD Fasting plasma glucose (mg/dl): 158 (±62) in known diabetes and 162 (±50) in unknown diabetes
- Mean ±SD waist circumference (cm) in men: 93 (±10) in known and 92 (±10.2) in unknown diabetes
- Mean ±SD waist circumference (cm) in women: 85.4 (±10) in known diabetes and 84.5 (±11) in unknown diabetes patients
- Family history of diabetes 38 known and 16 are unknown diabetes patients.
- Pre=hypertension (%): 27 in known diabetes, 30 in unknown diabetes
- Total cholesterol HDL/4-5 [31] (%) 62 in known and 68 in unknown triglycerides
- Hyper-triglyceridemia (%): 53 in known and 68 in unknown diabetes patients

Table 2: Comparison of diagnostic statistic risk score using threshold score >16 for prediction of known and undiagnostic diabetes.

The score was >16; the sensitivity was 0.64 (0.57–0.72) in undiagnosed patients and 0.80 (0.78–84) in diagnosed patients.

- Specificity: 0.68 (0.64–6.7) in undiagnosed, 0.55 (0.53–0.55)
- Positive predictive value: 0.1 (0.08–0.11) in undiagnosed patients, 0.16 (0.14–0.18) in diagnosed patients
- Negative predictive value: 0.96 (0.95–0.97) in undiagnosed diabetes patients and 0.95 (0.94–0.96) in known diabetic patients.
- Positive likelihood ratio: 2.0 (1.6–2.0) in undiagnosed patients, 1.8 (1.5–1.8) in diagnosed DM
- Negative likelihood ratio: 0.50 (0.40–0.60) in undiagnosed and 0.35 (0.32–0.40) in diagnosed

Table 3: Study of cardio-vascular risk factors according to diabetes status and risk score >16 in undiagnosed patients.

- Mean fasting plasma glucose (mg/dl): 164 true positives, 92 false positives
- Mean HDL (mg/dl): 42 true positive, 44 false positive
- Total mean cholesterol (mg/dl): 198 in true positives, 188 in false positives
- Mean serum triglyceride (mg/dl): 190 in true positives, 142 in false positives
- Hypertension percentage (%): 56 true positives, 42 false positives
- TC: HDL > 4.5 (%) 55 true positives, 50 false positives
- Triglyceride > 150 (mg/dl) (%) 52 true positives, 33 false positives
- Metabolic syndrome percentage (%): 86 true positives and 40 false positives
- BMI ≥ 25 kg/m^2 percentage (%) 65 true positives, 55 false positives

Table 1: Comparison of characteristics of diagnosed and un-diagnosed diabetes patients(Total No. of patients: 318)

Variables	Known Diabetes (220)	Un-diagnosed (98)
Percentage of (%) women	50	52
Mean age ±SD (years)	50 (±6)	48 (±8)
Mean body Mass Index (Kg/m2)	52 (±6)	49 (±8)
Mean ±SD Fasting plasma Glucose (mg/dl)	158 (±62)	162 (±50)
Mean ±SD waist circumference cm in Men	93 (±10)	92 (±10.2)
Mean ±SD waist circumference in Women	85.4 (±10)	84.5 (±11)

Family history of diabetes	38	16
Pre-hypertension (%)	27	30
HDL/4.5 [31] (%) Total cholesterol HDL > 4.5 (%)	62	68
Hyper triglyceridemia (%)	53	59

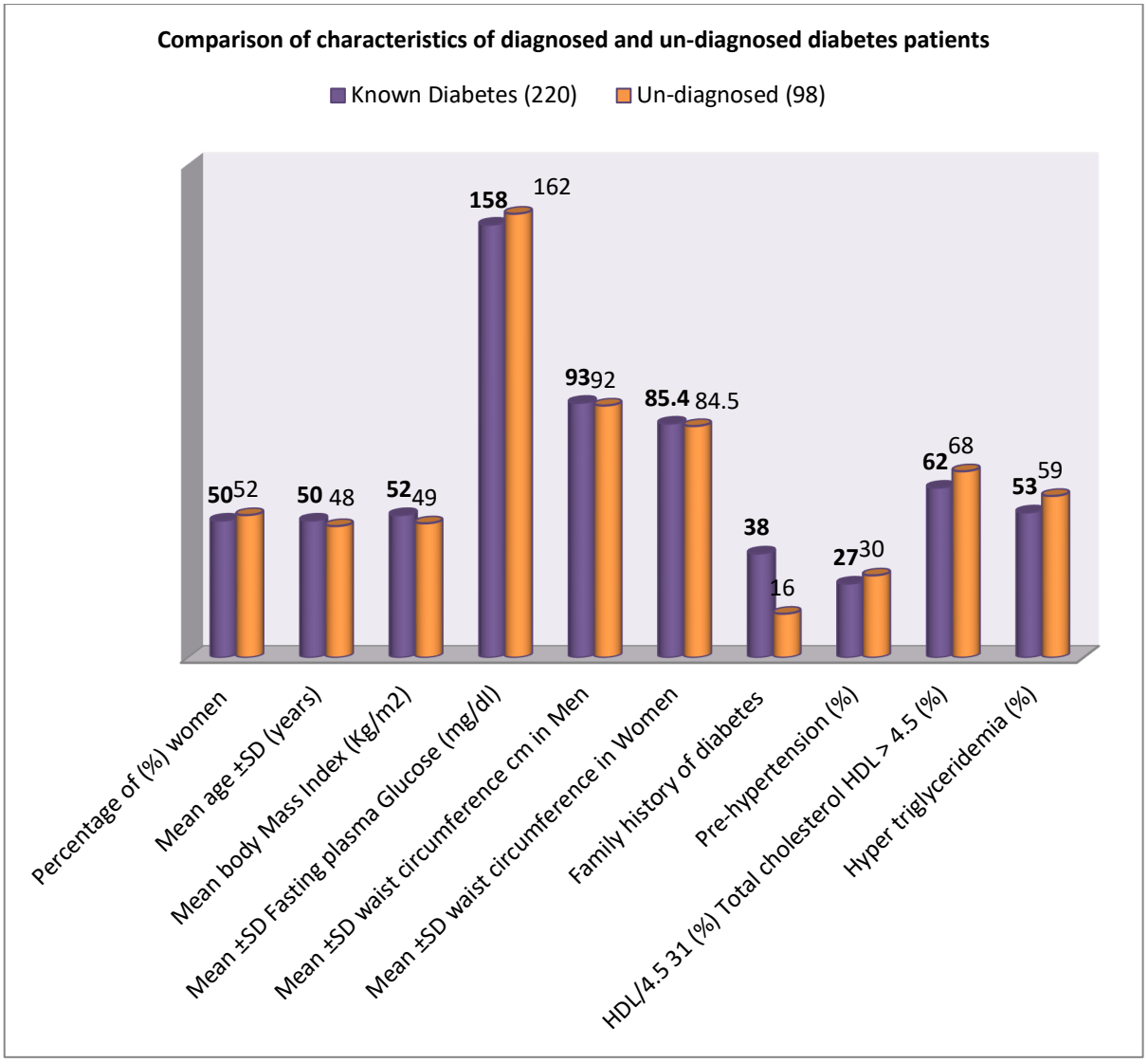

Figure 1: Comparison of characteristics of diagnosed and un-diagnosed diabetes patients

Table 2: Comparison of Diagnostic statistic risk score using a threshold score of >16 for prediction of known diabetes and undiagnosed diabetes (Total No. of patients: 318)

Score	**Un-diagnosed (98)**	**Diagnosed DM (220)**
> 16	Value (95%) CI	Value (95%) CI
Sensation	0.64 (0.57 – 0.72)	0.80 (0.78 – 0.84)
Specificity	0.68 (0.64 – 0.67)	0.55 (0.53 – 0.55)
Positive predictive value	0.1 (0.08 – 0.11)	0.16 (0.14 – 0.18)
Negative predictive value	0.96 (0.95 – 0.97)	0.95 (0.94 – 0.96)
Positive likelihood ratio	2.0 (1.6 – 2.0)	1.8 (1.5 – 1.8)
Negative likelihood ratio	0.50 (0.40 – 0.60)	0.35 (0.32 – 0.40)

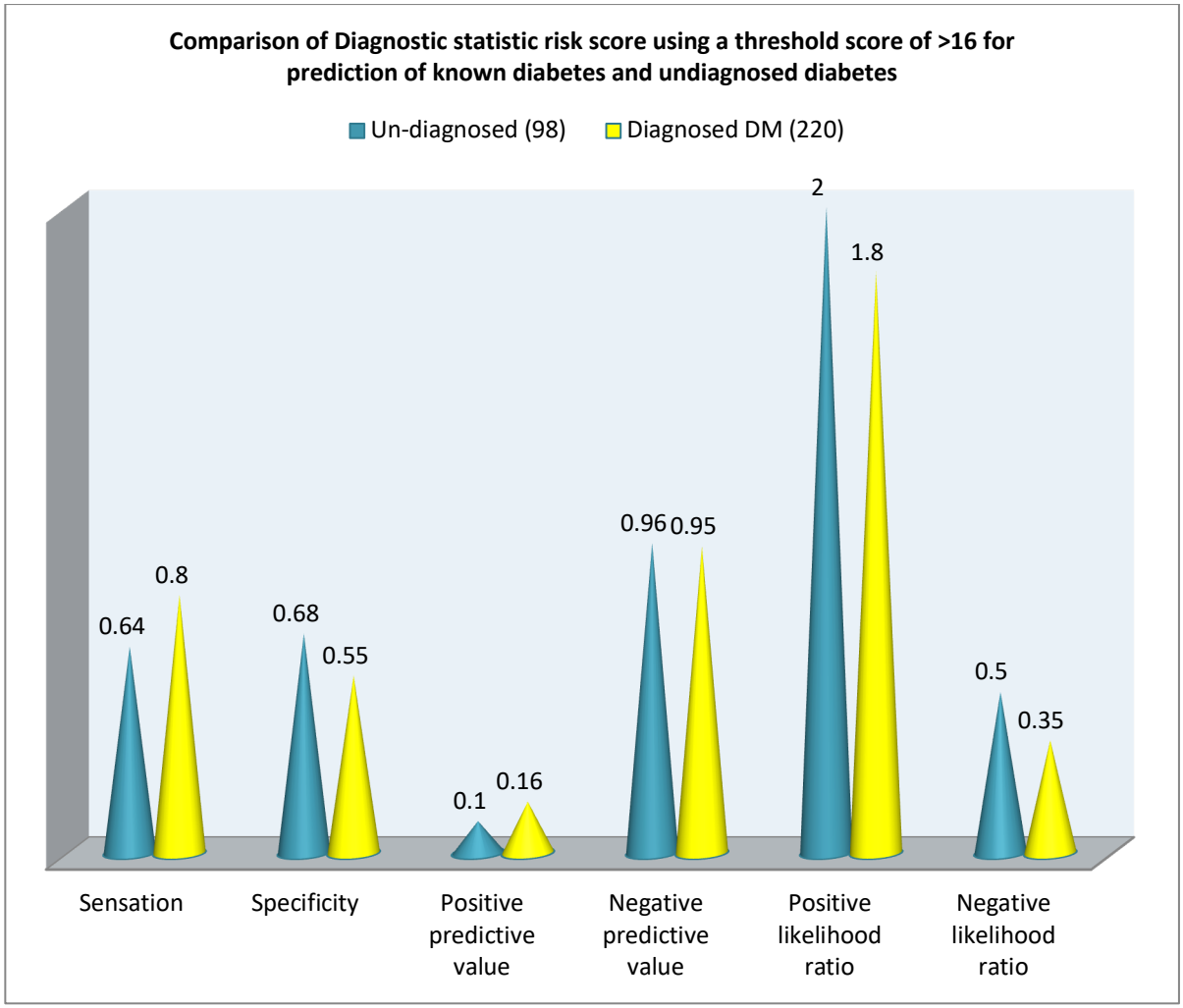

Figure 2: Comparison of Diagnostic statistic risk score using a threshold score of >16 for prediction of known diabetes and undiagnosed diabetes

Table 3: Study of cardio vascular risk factors according to Diabetes status and risk score >16 in un-diagnosed population

Details	True positive	False positive
Mean Fasting plasma glucose (mg/dl)	164	92
Mean HDL (mg/dl)	42	44
Total mean cholesterol (mg/dl)	198	188
Mean serum triglycerides (mg/dl)	190	142
Hypertension percentage (%)	56	42
TC: HDL>4.5 (%)	55	50
Triglyceride >150 mg/dl (%)	52	33
Metabolic syndrome percentage	86	44
BMI ≥25 Kg/m2 (%)	63	55

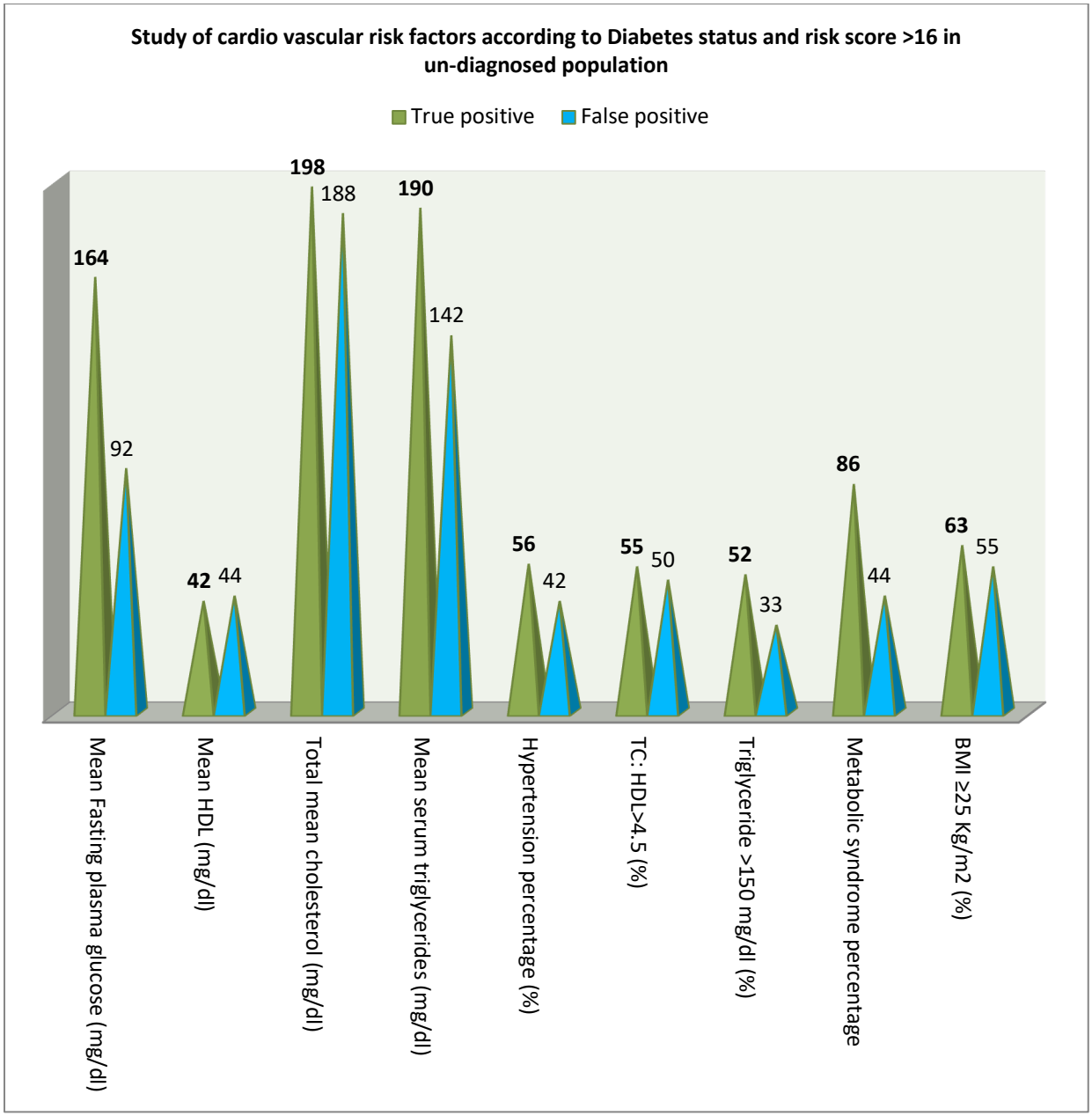

Figure 3: Study of cardio vascular risk factors according to Diabetes status and risk score >16 in un-diagnosed population

Discussion

Present study of risk factors for undiagnosed diabetes mellitus in the Telangana population. Out of 318 patients, 98 were undiagnosed, and 220 were diagnosed with diabetes. A comparative study of the characteristics of diagnosed and undiagnosed diabetic patients, age 50 (± 6) in known diabetes and 48 (± 8) in unknown diabetes. Body mass index was 52 (±6) in the known and 49 (±9) in the unknown. Mean ±SD Fasting plasma glucose was 18 (±62) in known diabetes and 162 (±50) in undiagnosed diabetes. Family history of diabetes was 38 in known and 16 in un-diagnosed Diabetes higher cholesterol: 68 in un-diagnosed, 62 in known diabetes. Higher triglycerides 59 in undiagnosed and 53 in known diabetes (Table 1). The comparison of diagnostic statistic risk scores using a threshold score of >16 for prediction of known and undiagnosed diabetes. Specificity was higher in undiagnosed diabetes: 0.68 (0.64–0.69), and the negative predicative value was higher in undiagnosed diabetes. Moreover, positive likelihood was higher at 2.0 (1.6–2.0), and the negative likelihood ratio was also higher at 0.50 (0.40–0.60) in undiagnosed diabetes (Table 2).

The study of cardio-vascular risk in undiagnosed diabetes as per risk score >16: The mean fasting glucose was 164, the mean HDL (mg/dl) was 42, the mean cholesterol (mg/dl) was 198, the mean serum triglyceride (mg/dl) was 190, the hypertension percentage was 56%, the metabolic syndrome percentage was 86, and the BMI percentage was 63

(Table 3). These findings are more or less consistent with previous studies [5,6,7]. It was also observed that the prevalence of DM increases with age [8]. It is reported that undiagnosed patients had lower education status; hence, they were ignorant about the signs and symptoms of DM [9]. Due to low education or illiteracy, these patients were unaware of their family history of DM.

Moreover, undiagnosed patients were associated with alcohol consumption; hence, it is hypothesized that the diabetogenic effects of alcohol include its contribution to inadequate insulin release, reduced insulin binding, inhibition of intracellular signaling, and the eventual development of insulin resistance [10]. It is also confirmed that undiagnosed DM patients's revealed significant association of hypertension and elevated lipid profile, especially cholesterol triglycerides [11,12].

Hence, hypertension and elevated cholesterol triglyceride were closely associated with undiagnosed DM. Undiagnosed DM is more prone to cardiovascular and cerebro-vascular diseases.

Summary and Conclusion

Present study of the risk factors of undiagnosed DM patients in Telangana. A simple cutaneous sign, acanthosis nigricans, was independently associated with the risk of type II DM. Hence, awareness of the signs and symptoms of DM has to be created in illiterate and labor-group people because late access to medical aid may lead to cardiovascular or cerebro-vascular disease because most of these diseases are irreversible and cause morbidity, economic burden to the family, and impair social life.

Limitation of study:

Owing to the tertiary location of the research center, the small number of patients, and the lack of the latest techniques, we have limited findings and results.

This research paper was approved by the ethical committee of the Mediciti Institute of Medical Sciences, Ghanpur (village), Medchal (mandal). Medchal Malkajgiri district, Hyderabad-501401.

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