**Introduction**

Globally, about 392 million people live with diabetes, and the number is expected to rise to 592 million by the year 2035.[1] Of the total estimated, about four-fifth live in low- and middle-income countries.[2] International Diabetes Federation estimates that diabetes accounts for 14.5% of all-cause mortality among people aged between 20 and 79 years.[1] There is high health care spending to treat diabetes and prevent its complications; estimated to be 673 billion USD and projected to increase by 20% in 2040.[1]

India is home for nearly 69.9 million people with diabetes mellitus, next only to China.[1] The burden of diabetes has increased significantly over the last few decades. As any other

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**How much do persons with diabetes in a rural area of South India know about diabetes management? A step toward person-centered care**

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**ABSTRACT**

**Introduction:** The burden of diabetes mellitus is increasing worldwide, more so in developing countries. Optimal diabetes care depends on adherence to management protocol, which can be brought about by shared decision-making. Patient’s knowledge on life-threatening complications and preventive strategies for the same is a prerequisite for shared decision-making. Hence, this study was carried out among diabetes patients to assess the level of knowledge on different aspects of diabetes management.

**Methodology:** A facility-based cross-sectional study was conducted among patients registered and seeking care from a Rural Primary Health Centre in Puducherry, South India. All the individuals with diabetes were included in the study. Trained MBBS interns interviewed the patients after obtaining informed consent. A semi-structured interview schedule was used to capture information on sociodemographic profile, disease characteristics, knowledge on different aspects of diabetes management, and prevention of diabetic complications. Data were entered and analyzed using EpiData software. Knowledge on each item was expressed as percentages.

**Results:** Of the total 172 participants, 58% were females, 63% were aged between 31 and 60 years. About half of the participants had diabetes for more than 5 years. Of the total, about 83% knew that there is a need for lifelong treatment. About 51%, 44%, 21%, and 9% were aware that diabetes can cause complications to eye, renal, foot, and heart, respectively. Of the total, about 74%, 78%, 17%, 15%, 35%, and 56% knew the correct frequency for monitoring of blood sugars, blood pressure, renal function, lipid profile, fundus, and foot, respectively.

**Conclusion:** This study shows that knowledge on few components of diabetes management is still limited, and there is a need to impart knowledge through health education to patients. Adequate knowledge on diabetes management principles is important for implementing patient-centered care in primary care setting.

**Keywords:** Diabetes complications, diabetes mellitus, knowledge, patient-centered care, primary care.

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developing country, India is facing the double burden of disease with a high burden of communicable and noncommunicable diseases (NCDs). In addition, the nonresponsive public health system has failed to provide quality care to diabetes patients. The National Programme for Control of NCDs in India is still in nascent stage of implementation. Prevention of these complications requires optimal adherence to self-management practices in addition to medication compliance. Patient-centered care with shared decision-making is the crux of the diabetes management. Patient’s adherence to self-management of diabetes depends on his/her involvement in setting the individualized targets. Although knowledge alone is not sufficient to bring about behavior change among diabetics, it is a vital prerequisite for such changes and step forward to patient-centered care. Thus, assessing the knowledge of diabetics regarding management, complications, and desired behaviors will help to know the readiness for patient-centered care. Furthermore, in the absence of structured diabetes education program in India, assessing knowledge of diabetes patients will help in designing setting-specific education programs. Ideally, with repeated contact with health-care system, the diabetes patients are supposed to have adequate knowledge on diabetes care. The knowledge assessment among diabetes patients also acts as a proxy indicator to assess the current status of interpersonal communication between health workers and patients. In this context, we carried out a study among patients with diabetes to assess the knowledge pertaining to prevention and early diagnosis of complications and lifestyle measures.

**Methodology**

**Study design and setting**

A facility-based cross-sectional study was conducted during the month of December 2015. The study was conducted in the Rural Health Training Centre (RHTC) of a Tertiary Care Teaching Hospital located in Puducherry. RHTC caters to a population of around 9800 individuals belonging to the villages of Ramanathapuram, Thondamanatham, Pillaiyarkuppam, and Thuthipet. Apart from routine outpatient and emergency medical services, special NCD clinics treating NCDs are held on specific days of the week. Around 500 patients with hypertension, diabetes, asthma, chronic obstructive pulmonary disease, epilepsy, hypothyroidism, or cardiovascular diseases are followed up in the NCD clinic. The services at the NCD clinics are provided by the MBBS trainees under the guidance of medical officer and resident doctors. Comprehensive care is provided to all patients that include medical consultation, counseling on lifestyle changes, laboratory services, and medicines. Laboratory is attached to the primary health center, and all diagnostic tests and drugs are provided to the patients free of cost.

**Study population**

All patients with diabetes mellitus attending NCD clinic and receiving follow-up care from RHTC were eligible to participate in the study.

**Sample size and sampling**

Assuming that about 50% of the study participants will have correct knowledge about different aspects of diabetes management, the calculated sample size was 100 with alpha at 0.05 and an absolute precision of 10%. A total of 180 diabetes patients were receiving care from RHTC, and all who gave consent were included in the study.

**Study tool and variables**

The interview schedule was developed in English and was translated into local language, Tamil. The Tamil version was later back-translated into English by a different investigator. The study variables include sociodemographic details such as age, gender, education status, occupation status, and the disease duration. Information on the participant’s knowledge on various aspects of management of diabetes, prevention, and management of complications that can arise as a result of diabetes and the risk of diabetes in family members were collected during the interview.

**Study procedure**

Informed consent was obtained from all participants before the interview. After obtaining informed consent, the patients were interviewed by the MBBS trainees using a structured interview schedule. The interviews were conducted after their routine follow-up consultation in the NCD clinic at RHTC. All participants were briefed regarding the purpose of the study, and the procedure was clearly explained to them. Confidentiality was maintained with respect to the individual patient’s identity during data entry and analysis.

**Data entry and analysis**

The data were entered using EpiData software version 3.0 (Odense, Denmark) and the analysis was carried out in EpiData Analysis software version 2.2.2.1 (The EpiData Association, Odense, Denmark). The categorical variables such as gender, age groups, education, occupation, and disease duration are summarized using proportions (percentages). Each of the items in the knowledge component is summarized using frequency and proportions.

**Results**

Of total 184 persons with diabetes registered with NCD clinic, 172 persons with diabetes (93%) were included in the study. The sociodemographic and the disease characteristics of the study participants are shown in Table 1. Of the total 172 participants,
majorsities were females (58%) and were aged between 31 and 60 years (63%). Two-fifth (40%) had no formal education. About half of the participants had diabetes for more than 5 years.

Participants’ knowledge on different aspects of diabetes management is shown in Table 2. Almost all participants (99%) were aware of the need for blood glucose monitoring during treatment. Of total, 31 participants (18%) were not aware of any symptoms of hypoglycemia. Regarding complications of diabetes, 87 participants (51%) were aware of eye complications and 75 participants (44%) were aware of renal complications. Awareness on feet and heart complications was reported by 24% and 9%, respectively. Regarding examination and investigations for persons with diabetes, 94% of the participants felt blood pressure should be monitored and about 80% reported eye examination (fundus). Renal function and lipid profile tests were reported by 39% and 44%, respectively [Table 3].

Regarding knowledge about the risk of diabetes in offsprings, ninety participants (52%) felt that their offsprings were at higher risk of developing type 2 diabetes mellitus and 72% felt that their offsprings need to be screened for diabetes mellitus. Of the total 172 participants, 152 participants (88%) had a son or daughter who was aged more than 18 years. Of these 152 households, 49% reported that none of their son or daughter had been screened for diabetes.

### Table 1: Sociodemographic characteristics of patients attending noncommunicable disease clinic in a rural Primary Health Center, Puducherry (n=172)

| Sociodemographic factors | Frequency (%) |
|-------------------------|---------------|
| Age (years)             |               |
| 30 and less             | 4 (2.3)       |
| 31-60                   | 109 (63.4)    |
| >60                     | 57 (34.3)     |
| Gender                  |               |
| Male                    | 72 (41.9)     |
| Female                  | 100 (58.1)    |
| Educational status      |               |
| No formal education     | 69 (40.1)     |
| Primary completed       | 45 (26.2)     |
| Middle school completed | 27 (15.7)     |
| High school completed   | 24 (14.0)     |
| Higher secondary completed | 7 (4.1)  |
| Occupation              |               |
| Agricultural laborer    | 31 (18.0)     |
| Laborer                | 35 (20.3)     |
| Homemaker              | 87 (50.6)     |
| Unemployed              | 7 (4.1)       |
| Salaried                | 12 (7.0)      |
| Duration of diabetes (years) |     |
| <2                      | 31 (18.0)     |
| 2-5                     | 54 (31.4)     |
| 6-10                    | 50 (29.1)     |
| >10                     | 37 (21.5)     |

### Table 2: Level of knowledge on diabetes management among patients attending noncommunicable disease clinic in a rural Primary Health Centre, Puducherry (n=172)

| Diabetes knowledge component | Frequency of correct response (%) |
|------------------------------|----------------------------------|
| Need for monitoring blood glucose level | 170 (98.8) |
| Frequency of blood sugar monitoring | 127 (73.8) |
| Blood sugar levels for satisfactory control | 39 (22.7) |
| Requirement of lifelong treatment | 142 (82.6) |
| Symptoms of low blood glucose |                                  |
| Giddiness | 114 (66.3) |
| Palpitations | 18 (10.5) |
| Sweating | 16 (9.3) |
| Others (tremors, weakness) | 10 (5.8) |
| Aware of things to do in case of low blood glucose | 123 (71.5) |
| Lifestyle measures to manage diabetes |                                 |
| Dietary measures | 138 (80.2) |
| Physical activity | 91 (52.9) |
| Others (yoga, meditation) | 4 (2.3) |
| Should not change or skip medications on own | 167 (97.1) |

### Discussion

The present study on knowledge about diabetes in a primary care setting revealed that though awareness about blood sugar monitoring was good, knowledge on complications and tests to screen for complications was limited. Majority of the participants reported dietary modification would help in diabetes management and only half identified physical activity as a way to control blood sugar. Furthermore, only half of the offsprings were screened for diabetes though majority was aware of that their children are at high risk for developing diabetes mellitus.

A study done in a tertiary care hospital, Ludhiana, showed that 87% of the participants were aware of blood sugar monitoring. Our study showed a higher level of awareness (99%) with regard to blood sugar monitoring. In our study, the proportion who reported correct frequency of blood sugar testing was 73%. This is comparatively higher than other studies done in India, where the proportion ranges between 20.7% and 39.6%.[12,13] This high level of awareness may be due to the exposure of diabetes patients to repeated health talks delivered by MBBS interns and nursing students posted in PHC. The health talks mainly focus on improving adherence of the patients to management protocol of the PHC.

A study done in Saurashtra region, Gujarat, reported that 22% of patients felt that medications can be stopped once glycemic control is achieved, which is similar to our findings.[14] Regarding additional lifestyle measures in the management of diabetes, 80% and 53% of our study participants have reported dietary measures and physical activity. This is similar to the findings of other studies from India.[14,12] The awareness regarding symptoms
of hypoglycemia was comparatively higher in the current study than reported by Gulabani et al., where 48.5% did not know any symptom of hypoglycemia. Although other studies have shown that higher proportion of participants were aware that diabetes mellitus can affect other organs, knowledge about the involvement of heart and feet was less in our study.

This is the first study comprehensively assessing the knowledge about diabetes complications in a primary health-care setting and the response rate was high (93%). Few limitations include lack of in-depth assessment of knowledge on physical activity and diet modification. The study was conducted among patients registered with a single primary health center, and the findings cannot be generalized to other settings.

The study has few implications. Considering the limited knowledge on complications, emphasis has to be given educating the persons with diabetes and also general population. These patient education measures will help in shared decision-making by bridging knowledge gap between provider and patient. Poor interpersonal communication skills of health-care workers may be a reason for limited knowledge among patients. Capacity building of health-care providers and setting up standard protocols for counseling diabetes patients may help in improving the knowledge and disease outcomes.

Primary care physicians are the main source of care for most patients with diabetes. In addition to standard management protocols, involving patients in shared decision-making process is important to improve patient outcomes in primary care setting. The gaps in the knowledge of patients identified through this study help in formulating context-specific health education programs.

### Conclusion

This study shows that knowledge on few components of diabetes management is still limited, and there is a need to impart knowledge through health education to patients. Structured education programs and one-to-one consultation during physician consultation may be ways to impart knowledge among patients. Adequate knowledge on diabetes management principles is important for implementing patient-centered care.

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### Conflicts of interest

There are no conflicts of interest.

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