Fasa Registry on Diabetes mellitus (FaRD): Feasibility Study and Pilot Phase Results

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Abstract

Background

Diabetes mellitus (DM) is the most common chronic diseases. This disease is the main risk factor of fetal diseases such as myocardial infarction and stroke. There is no cure for DM, and an effective strategy must control it. Every attempt to control DM and patient outcomes require a surveillance system to consider the efficacy and safety measures.

Fasa Registry on Diabetes mellitus (FaRD) is the first population-based registry for DM in Iran targeted to provide a meticulous description of social, mental health, clinical, and laboratory values of patients, to consider the management patterns of these patients, to discover the degree of adherence to the recommendations.

Methods

the diagnosis of diabetes (Type I and II) characterized by the level of plasma glucose. The pregnant women were excluded. Three registrar nurses collected data on demographics, physical exams, past medical history, medication history, and laboratory findings.

Results

the pilot phase included the first 381 patients, 257 (67.5%) were women, and 124 (32.5%) were men. With a mean age of 57.54 ± 12.12 years among subjects, the 347 (94.5%) of them had DM type 2, and 20 (5.4%) of them had type 1.

Conclusion

Based on our results, the characteristics of patients suffering DM do not afford their medical cost, so the majority of them were not adherence to the practice guidelines.

The achievement of FaRD helps physicians and patients to better controlling the DM.

The finding of this pilot study shows the FaRD is feasible, and it will make a comprehensive population-based registry for DM in the region.

Background

Diabetes mellitus (DM) can be considered one of the most common chronic diseases globally, the prevalence of which has been rising dramatically each year. From 1985 to 2017, the number of patients with DM has increased from 35 to 415 million worldwide. Moreover, it is estimated that 642 million people will have DM until 2040 [1]. In Iran, the prevalence of patients with DM is similar to global trends, and it is 11.3–14.6% [2, 3]. Moreover, due to the Pars Cohort Study in Southern Iran, 9.9% of individuals in this region have DM[4]. A study showed that in Fars province, 8.31% of the population have DM if we
consider the fasting plasma glucose (FPG) as a diagnostic test, and if we change it to hemoglobin A1c (HbA1c), 9.59% of people have DM [5].

In this disease, the concept of treatment is different from other disorders such as infections because the disease cannot completely be eliminated as it is incurable. At the same time, it can only be managed or be prevented from progression and developing complications. Complications of DM include two main groups of microvascular and macrovascular complications. Nephropathy, neuropathy, retinopathy, and diabetic foot syndrome are microvascular complications, while coronary heart disease, cerebral artery disease and peripheral artery disease are macrovascular complications [6]. The remarkable point regarding these complications is that no one can expect to have these complications quickly with the onset of DM, which can show the significance and benefit of prevention.

On the other hand, the effects of different management on the incidence and severity of these complications and the effects on various aspects of the patient's life are less focused, and require long-term studies with the patient follow-up. The diabetes control and complications trial (DCCT) study in the USA showed that long-term treatment of type 2 DM has a better effect on preventing macrovascular complications [7]. Another large study in the UK, the UK prospective diabetes study (UKPDS) found that long-term treatment in patients with type 2 DM had similar effects [8]. Macrovascular complications in the DCCT and the epidemiology of diabetes interventions and complications (EDIC) studies have also proven that long-term treatment has a better outcome [6, 9].

Besides, due to the lack of studies on the costs of prevention, screening, and treatment, it is impossible to comment on the compliance and majority of international guidelines in our society. Witek et al. [6] in very different study designs with longer follow-ups, reported that the cut-off point of HbA1c for their population is not the same as the one for which American Diabetes Association (ADA) reports yearly [10]. This discrepancy may be due to the subjects’ cultural, social, and lifestyle differences [11]. Consequently, as an Iranian rural population, our region may also have many differences in other areas and countries.

Although the progression and burden of DM in the Middle East have been predicted by the international health organizations. Due to the spread of the disease in our region and a need for national health organizations on a large scale, such as health ministries and governments, especially for treatment, complications and correlations between cognitive impairment, physical activity and sleep quality, etc. a study should be conducted to prevent further complications; therefore, this study was designed to cover all diabetic patients in the region, and able us to identify the DM prevalence, risk factors and complications by a population-based registry, and help us organize a better plan for health policies.

**Methods**

**Objectives**

Our objectives were i) to report a full-detailed description of the baseline characteristics of patients, referred to the Fasa Diabetes Clinic (FDC) associated with Fasa University of Medical Sciences (FUMS),
ii) to explore our conventional management patterns of patients iii) to investigate if global treatment guidelines are practically helpful in an Iranian population, iv) to find out the prognostic factors for patients.

In this population-based study, we have reported the prevalence and incidence rate of DM in the region. We defined our objectives as the determination of correlation between age, sex, education, job, living place, sleep pattern, anxiety, depression, physical activity, medication, and DM events, with the outcomes. (unpublished data)

The administration of this study is performed by the endocrinology department. Also, Non-Communicable Diseases Research Center (NCDRC) related to FUMS, funded this study. NCDRC Previously has run Fasa Registry of Myocardial Infarction (FaRMI) [12] and Fasa Registry For Systolic Heart Failure (FARSH) [13]. Relevant research projects are granted by NCDRC in a complementary manner. The team of FaRD includes one Endocrinologist, two internists, one psychiatric, two general practitioners, and one pharmacologist. They have been asked not to change the conventional management patterns for the patients.

Patients

Every patient, who has been referred to the FDC with the diagnosis of diabetes (Type I and II) characterized by the following criteria;

- Hemoglobin A1c ≥ 6.5%

Or

- Fasting plasma glucose ≥ 126 mg/dL

Or

- Glucose tolerance test ≥ 200 mg/dL during an oral glucose tolerance test

Or

- Hyperglycemia symptoms and random plasma glucose ≥ 200 mg/dL

has been entered our study. Fasting condition has been considered as at least 8 hours, and oral glucose tolerance test should be measured plasma glucose two hour after intake 75gr of glucose dissolved in water. The glycemic goals were recommended by ADA[11] are 80–130 mg/dL for pre-prandial capillary plasma glucose and less than 180 mg/dL for postprandial capillary plasma glucose and less than 7% for Hemoglobin A1C.

The classic symptoms of hyperglycemia have been defined as polyuria, polydipsia, weight loss, and also random definition at any time of the day without considering the previous meal. All of these tests should
be performed in a certified and standardized laboratory. Patients with gestational DM and Diabetes Insipidus have been excluded.

**Description of the region**

FUMS is the main responsible institution of the population in the Eastern part of Fars province in Iran. It is a referral center for a population more than 250,000 in one major city and several towns and villages around it.

The Family Physician program in urban and rural regions and healthcare workers called "Behvarz" from the primary health care system of the "health houses" in towns and villages have been previously implemented in the region for several years. This health network helped our study in the first step of screening prediabetic individuals and referring them to the FDC.

**Recruitment of the registry**

Three dedicated nurses, who were in charge of the registration were trained by the head of endocrinology department of FUMS, who was the main principal investigator (PI) for two months. The Endocrinologist was responsible for approving the final DM diagnosis of the patients., Two internists also helped the PI visit the patients. Patients were registered by nurses daily except for holidays and weekends in the online form by using a computer. The data were simultaneously recorded into a university-based server with a verified firewall. In case of a challenging situation in completion of online forms and missing data, the PI endocrinologist has been available for consultation.

**Collecting the data**

For phase 1, the data have been collected in seven forms as follows;

Demographics, Lifestyle, occupation, physical exam, past medical history, medication history, and laboratory findings. The details of these forms are shown in supplement 1 and some of them do not publish till now.

**The patients' follow-up**

As we described earlier, each patient would be scheduled for a monthly visit at the beginning of the registry. In each visit, registrar nurses would record the data with a specific focus on occurrence of hypo/hyperglycemia and hospitalization for any reason. If the patients did not show up at the scheduled time, the registrar nurses would interview patients or their relatives via telephone asking their reason for not coming at the scheduled time, and would re-schedule another visit for them. If the patients passed away, the regional and national death registers would search for the cause of death, and in the case of nonsense coding a verbal autopsy would be made by trained staff.

**The quality of the data**

All data fields are sensitive to missing values, and the nurses would be notified if they want to save the forms with empty fields. A team of research assistants help to monitor the data monthly and check their
quality. Every three months, the central database is analyzed by the steering committee placed in the NCDRC.

**The progress of the study**

The protocol of this study was registered in the NCDRC on 1st of November 2019. The first patient was enrolled on 1st of May 2020 and patient registration will continue until 1st of May 2026.

**Statistical methods**

Our continuous data have been reported as mean ± standard deviation (SD), minimums, maximums, frequencies and percentages (%) have been used to report discrete variables.

**Results**

In the pilot phase included 381 patients with mean age of 57.54 ± 12.12 years and most them were old adult. Also, 67.5% of patients were female and 85.3% of subjects among the population were married. In total, 17(4.5%) of subjects were cigarette and/or opium and/or water pipe users. The majority of patients did not have regular job and income. The details of baseline demographic variables of the patients are reported in Table 1.

Table 2 shows the most of the patients have DM type 2 (94.5%) and more than half have hypertension also, more than 70 % of patients have Overweight or obese. Sixty-three percent of the patients had a positive family history of DM in their first relatives, and hypertension with 43.3% had the first rank among past medical histories. More than 90% of our patients did not have a history of admission to hospital, but in those with a positive admission history, a range of some other background diseases were found. More details on the medical records of our patients are presented in Table 2.

In Table 3, the scales of adherence to self-care in patients are presented. More than 60% of subjects respected to do regular laboratory test and the annual eye exam had the second rank self-care factor with 60% frequency, which was followed by daily foot exam (58.3%), self-capillary plasma glucose monitoring (56.0%) and regular physician visit (52.0%), respectively.

Table 4 presented the details anthropometric values, blood pressure in sitting and supine position, heart rate, and raspatory rate. So, the average of the BMI, systolic blood pressure, and diastolic blood pressure in sitting position was 28.17 ± 5.12 kg/m\(^2\), 127.31±16.52 mmHg, and 79.72±8.94 mmHg, respectively.

The primary symptoms and their duration that were guided to diagnoses DM shows in Table 5

Polydipsia and polyuria were most frequent symptoms Moreover, 43.6% of the patients had two symptoms before being diagnosed with DM, and the majority of patients had symptoms of DM less than six months.
The baseline laboratory values and glucose statistics and target of the patients demonstrated in Table 6 and Table 7, respectively. The mean of pre and post prandial plasma glucose higher than normal range and more 60% of patients were higher than target range moreover A1C showed their PG were high in three months ago. Also, the lipid profile showed the men the triglycerides was high. The renal function of patients was mild distributed.

Table 7 presents the treatment regimen of our patients. In total, 145 (38.1% of the) subjects used insulin, and 312 (81.9%) of patients used oral agents. LANTUSâ (Insulin glargine) was most common, that used by 74 (19.5%) of subjects. Then, came the following insulins, 67 (17.6%), 45 (11.8%), 15 (3.9%), 11 (2.9%), 9 (2.4%), and 1(0.3%) of patients used NovoRapidâ (insulin aspart), NovoMix® (biphasic insulin aspart 30/70), Toujeo® (insulin glargine injection), Apidra® (insulin glulisine), and LEVEMIR® (insulin detemir), respectively. In oral medications, more than half patients used metformin as the most frequent oral agent. Two oral agents were the most popular regimen in our patients, however one oral agent (32.3%) regimens was second common strategy treatment.

Discussion

DM is a multifactorial and chronic disease that involves millions of people around the world every year. Apart from suffering from DM, patients endure the cost of treatment, which is an important matter for them and governments [1]. The mean of DM cost for patients with DM increases 70% annually. Moreover, the cost of hospitalizations for each patient per year is more than $7,000US in China [14]. Other international registry programs as well as FaRD significantly decrease incidences of complications, mortality and cost of DM. For example, after five years, cost of DM was more than $7,200 (US) less for each patient in the USA[15].

Estimated, the direct medical cost of diabetes in Iran is more than $4 billion per year.[16] the results of this study shows most of patients do have income so their plasma glucose are not control. This is a sign that the patients do not afford their medical cost.

Therefore, real world insights about the specific characteristics of these patients is to manage the DM in order to decrease hospitalizations and complications of this disease. FaRD will provide the specific database to collect the details of demographic characteristics, clinical and laboratory findings of patients with DM to better controlling of their disease in order to reduce the rate of complications and mortality. FaRD provides a comprehensive range of characteristics related to DM.

Hypertension and hyperlipidemia have been respectively the two medical conditions with the greatest positive correlation with DM found in this study.

The well-being of the population is the main duty of the local medical university. Therefore, medical education and health improving indices must be provided by the FDC. The main strength of the FaRD is having a detailed data acquisition from multiple aspects. Unpredicted minimal missing data, selection bias due to lack of randomization, modest study population compared to the national population and
current unstable conditions emanating from the coronavirus disease in the year 2019 (COVID-19) pandemic, though temporary, are limitations of this DM registry.

Finally, the frequencies of chronic complications of DM in order to compare with the current status will be recorded during this study. It is recommended to register DM patients at the national level.

**Conclusion**

The base of the above-mentioned framework the population-based registration of DM cases in Fasa was feasible and the results of the pilot phase are promising.

**Abbreviations**

**ADA**  
American Diabetes Association

**BMI**  
Body Mass Index

**BSc**  
Bachelor of Science

**DBP**  
Diastolic Blood Pressure

**DCCT**  
diabetes control and complications trial

**DM**  
Diabetes mellitus

**EDIC**  
epidemiology of diabetes interventions and complications

**Family history**  
FH

**FaRD**  
Fasa Registry on Diabetes mellitus

**FaRMI**  
Fasa Registry of Myocardial Infarction

**FARSH**  
Fasa Registry for Systolic Heart Failure

**FDC**  
Fasa Diabetes Clinic

**FPG**  
fasting plasma glucose

**FUMS**  
Fasa University of Medical Sciences
Declarations

**Ethics approval and consent to participate**

Our study protocol has been set out along with the relevant guidelines and regulations of the region and nation. Our study protocol was also approved by the regional and national research ethics committee (the equivalence of institutional review boards) of FUMS. (IR.FUMS.REC.1399.037) It should be mentioned that at the beginning of the study, registry personnel talked with patients and described this study's aims and process. Each participant is informed comprehensively then asked them to fill and sign a written consent willingly. So, all participants wrote informed consent and compliance with enrollment in this study.

**Consent for publication**

Not applicable

**Availability of data and materials**

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

**Competing interests**

The authors declare that they have no competing interests
Funding

The NCDRC of FUMS funded this registry system (code: E-97274). The NCDRC provided the budget of employees and equipment of this registry system. The regulations of the data recording and handling of FaRD provided by the Iranian legal rules.

Authors’ contributions

Conceptualization: BP AK.

Data curation: AA FM.

Formal analysis: AK MHY.

Funding acquisition: BP AK AA.

Investigation: PB AK AA MHY.

Methodology: AK MHY ARN.

Project administration: AK.

Resources: AA BP.

Software: AK AA.

Supervision: BP.

Validation: BP AA.

Visualization: SM FM.

Writing ± original draft: AK MHY ME.

Writing ± review & editing: BP AK MHY ARN ME SM

All authors have read and approved the manuscript

Acknowledgment

This study has extracted the thesis of the residency course and was found to be in accordance to the ethical principles and the national norms and standards for conducting Medical Research in Iran.

References
1. Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J: *Harrison's principles of internal medicine*, vol. 2018: Mcgraw-hill New York; 2018.

2. Esteghamati A, Etemad K, Koohpayehzadeh J, Abbasi M, Meysamie A, Noshad S, Asgari F, Mousavizadeh M, Rafei A, Khajeh, EJD, et al: *Trends in the prevalence of diabetes and impaired fasting glucose in association with obesity in Iran: 2005–2011*. 2014, 103(2):319–327.

3. Rashedi V, Asadi-Lari M, Delbari A, Fadayevatan R, Borhaninejad V, Foroughan MJD, Research MSC, Reviews. *Prevalence of diabetes type 2 in older adults: Findings from a large population-based survey in Tehran, Iran (Urban HEART-2)*. 2017, 11:S347-S350.

4. Akbarzadeh A, Salehi A, Vardanjani HM, Poustchi H, Gandomkar A, Fattahi MR, Malekzadeh RJAoIM. *Epidemiology of Adult Diabetes Mellitus and its Correlates in Pars Cohort Study in Southern Iran*. 2019, 22(11).

5. Hajipour MJ, Djalalinia S, Sheidaei A, Yoosefi M, Zokaiee H, Damirchilu B, Mahmoudi Z, Mahmoudi N, Hajipour MJ, Peykari N. * Protocol Design for Large-Scale Cross-Sectional Studies of Surveillance of Risk Factors of Non-Communicable Diseases in Iran: STEP 2016. Archives of Iranian medicine* 2017, 20(9).

6. Witek PW, Wołkow P, Stancel-Moźwiło J, Wojtyczek K, Sieradzki J, Małecki M. The Polish Diabetes Registry for adults—a pilot study. *Clinical Diabetology*. 2012;1(1):3–11.

7. Control D, Group CTR. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *New England journal of medicine*. 1993;329(14):977–86.

8. Group UPDS: *Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33)*. *The lancet* 1998, 352(9131):837–853.

9. Control D, Trial C. Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) Study Research Group Intensive diabetes treatment and cardiovascular disease in patients with type 1 diabetes. *N Engl j Med*. 2005;353(25):2643–53.

10. care ADAJD. *4. Comprehensive medical evaluation and assessment of comorbidities: standards of medical care in diabetes—2019*. 2019, 42(Supplement 1):S34-S45.

11. Care ADAJD. *6. Glycemic Targets: Standards of Medical Care in Diabetes—2020*. 2020, 43(Supplement 1):S66-S76.

12. Bahramali E, Askari A, Zakeri H, Farjam M, Dehghan A. Zendehdel KJPo: *Fasa Registry on Acute Myocardial Infarction (FaRMI): feasibility study and pilot phase results*. 2016, 11(12).

13. Bahramali E, Dehghan A, Farjam M, Zakeri H, Askari A. Fasa Registry for Systolic Heart Failure (Farsh), Feasibility Study. *Acta Healthmedica*. 2017;2(2):191–1.

14. Huang Y, Vemer P, Zhu J, Postma MJ, Chen W. Economic Burden in Chinese Patients with Diabetes Mellitus Using Electronic Insurance Claims Data. *PLoS One*. 2016;11(8):e0159297.

15. Jiao FF, Fung CSC, Wan EYF, Chan AKC, McGhee SM, Kwok RLP, Lam CLK. Five-Year Cost-effectiveness of the Multidisciplinary Risk Assessment and Management Programme—Diabetes
16. Davari M, Boroumand Z, Amini M, Aslani A, Hosseini M. The direct medical costs of outpatient cares of Type 2 diabetes in Iran: A retrospective study. 2016, 7(1):72–72.

Tables

Table 1. The demographic variables of patients with DM
| Variables               | Frequency (%) |
|-------------------------|---------------|
| **Gender**              |               |
| Man                     | 124 (32.5)    |
| Woman                   | 257 (67.5)    |
| **Marital status**      |               |
| Single                  | 23 (6.0)      |
| Married                 | 325 (85.3)    |
| Widow                   | 30 (7.9)      |
| Divorced                | 2 (0.5)       |
| **Age** (Mean ± SD: 57.54 ± 12.12) |           |
| Below 40 years old      | 37 (9.7)      |
| Between 40 to 59 years old | 163 (42.8)  |
| Above 60 years old      | 181 (47.5)    |
| **Number of children**  |               |
| 0 child                 | 44 (11.5)     |
| 1 child                 | 15 (3.9)      |
| 2 children              | 36 (9.4)      |
| 3 children              | 49 (12.9)     |
| 4 children or more      | 237 (62.2)    |
| **Education**           |               |
| Illiterate              | 104 (27.7)    |
| Primary school          | 124 (33.0)    |
| Secondary school        | 62 (16.5)     |
| Diploma                 | 53 (14.1)     |
| BSc<sup>a</sup>         | 21 (5.6)      |
| MSc<sup>b</sup>         | 11 (2.9)      |
| **Regular consumption of tea** | 337 (92.3)  |
| **Regular consumption of coffee** | 3 (0.8)     |
| **Current addiction**   |               |
|                      |        |
|----------------------|--------|
| Cigarette            | 11 (3.0) |
| Opium                | 5 (1.3)  |
| Hookah               | 4 (1.0)  |
| **Job status**       |        |
| Have a Job           | 151 (39.6) |
| No job               | 230 (60.4) |
| **Night shift status** |      |
| Without night shifts | 298 (78.2) |
| With night shifts    | 83 (21.8) |
| **Work time per day** |      |
| Less than 1 hour     | 171 (74.6) |
| Less than 6 hours    | 9 (3.9)   |
| 6 to 12 hours        | 44 (19.2) |
| 12 to 24 hours       | 5 (2.1)   |
| **Workdays in week** |        |
| Less than 1 day      | 166 (72.1) |
| 1 to 3 days          | 6 (2.6)   |
| 3 to 7 days          | 58 (25.2) |
| **Income per month** |        |
| Do not have income   | 62 (19.3) |
| Low income           | 185 (57.8) |
| Middle income        | 36 (11.2) |
| Upper middle income  | 34 (10.6) |
| High income          | 3 (0.9)   |

*BSc: Bachelor of Science, *MSc: Master of Science, *support by charities

Table 2. The medical records of patients with DM
| Variables                        | Frequency (%) |
|---------------------------------|---------------|
| **Type of DM**                   |               |
| DM type 1                        | 20 (5.4)      |
| DM type 2                        | 347 (94.5)    |
| **Blood Pressure**               |               |
| Normal                           | 66 (17.3)     |
| Elevated                         | 45 (11.8)     |
| Hypertension stage 1             | 196 (51.4)    |
| Hypertension stage 2             | 53 (13.9)     |
| **Weight Status**                |               |
| Underweight (BMI: below 18.5)   | 5 (1.6%)      |
| Healthy Weight (BMI: 18.5 - 24.9)| 82 (26.4%)    |
| Overweight (BMI: 25 - 29.9)     | 116 (37.3%)   |
| Obese (BMI: more than 30)       | 108 (34.7%)   |
| **Family history**               |               |
| Do not have FH                   | 127 (33.3)    |
| In first degree relatives        | 240 (63.0)    |
| In second degree relatives       | 14 (3.7)      |
| **History of other diseases**    |               |
| Hypertension                     | 165 (43.3)    |
| Hyperlipidemia                   | 151 (39.6)    |
| Hypothyroidism                   | 33 (8.7)      |
| Myocardial infarction            | 5 (1.3)       |
| Hyperthyroidism                  | 4 (1.0)       |
| Others                           | 3 (0.8)       |
| **Records of hospital admission**|             |
| Do not have admission            | 347 (91.1)    |
| **Cause of hospital admission**  |               |
| High blood sugar                 | 14 (3.7)      |
Cardiovascular disease  
10 (2.6)

Diabetic ulcer  
1 (0.3)

Others  
9 (2.4)

Family history: FH

Table 3. Scales of adherence to self-care in registered patients

|                   | Always Frequency (%) | Most times Frequency (%) | Sometimes Frequency (%) | Never Frequency (%) |
|-------------------|-----------------------|--------------------------|-------------------------|---------------------|
| Regular physician visit | 198 (52.0)            | 54 (14.2)                | 13 (3.4)                | 116 (30.4)          |
| Daily foot exam    | 153 (58.3)            | 79 (30.1)                | 26 (9.9)                | 4 (1.5)             |
| Self PG monitoring | 148 (56.0)            | 72 (27.2)                | 42 (15.9)               | 2 (0.7)             |
| Annual eye exam    | 156 (60.0)            | 70 (26.9)                | 33 (12.6)               | 1 (0.3)             |
| Regular laboratory test | 232 (60.9)           | 27 (7.1)                 | 7 (1.8)                 | 115 (30.2)          |

PG: plasma glucose

Table 4. The details of anthropometric values, blood pressure in sitting and supine position, heart rate, and respiratory rate in patients with DM
| Variables                     | Mean  | SD   | SE   | Min-Max |
|-------------------------------|-------|------|------|---------|
| Height (m)                    | 161.08| 9.44 | 0.52 | 128-192 |
| Weight (Kg)                   | 73.06 | 13.71| 0.72 | 26-165  |
| BMI (Kg/m²)                   | 28.17 | 5.12 | 0.28 | 13.27-67.80 |
| Waist circumferences (cm)     | 91.52 | 16.06| 1.041| 42-130  |
| Hip circumferences (cm)       | 95.53 | 16.15| 1.047| 44-140  |
| Wrist circumferences (cm)     | 18.72 | 1.94 | 0.12 | 13-25   |
| Blood Pressure                |       |      |      |         |
| SBP (mmHg) Sup                | 128.75| 16.83| 1.2  | 90-180  |
| SBP (mmHg) Sit                | 127.31| 16.52| 0.87 | 90-180  |
| DBP (mmHg) Sup                | 79.79 | 10.39| 0.80 | 10-125  |
| DBP (mmHg) Sit                | 79.72 | 8.94 | 0.47 | 50-125  |
| Heart Rate (BPM)              | 81    | 6.07 | 0.58 | 58-90   |
| Respiratory Rate (1/min)      | 19.88 | 0.174| 1.81 | 16-26   |

**BMI**: Body Mass Index; **SBP**: Systolic Blood Pressure; **DBP**: Diastolic Blood Pressure; **Sup**: Supine position; **Sit**: Siting position.

Table 5. The Primary symptoms of DM in registered patients
| Variables                       | Frequency (%) |
|--------------------------------|---------------|
| **Symptoms**                   |               |
| Polydipsia                     | 176 (46.2)    |
| Polyuria                       | 176 (46.2)    |
| Weight loss                    | 104 (27.3)    |
| Weakness                       | 96 (25.2)     |
| Fatigue                        | 56 (14.7)     |
| Others                         | 42 (5)        |
| No symptoms                    | 68 (17.8)     |
| **Symptom collection**         |               |
| One symptom                    | 36 (9.4)      |
| Two symptoms                   | 166 (43.6)    |
| Three symptoms                 | 63 (16.5)     |
| Four or more symptoms          | 22 (5.8)      |
| **Duration of symptoms**       |               |
| Less than six months           | 277 (72.7)    |
| One year                       | 16 (4.2)      |
| One to two year(s)             | 17 (4.5)      |
| More than two years            | 3 (0.8)       |

Table 6. Laboratory values in registered patients.
| Variables                                         | Mean     | SD      | SE      | Min-Max  |
|--------------------------------------------------|----------|---------|---------|----------|
| Pre-prandial plasma glucose mg/dL                | 182.83   | 78.68   | 4.19    | 52-668   |
| Postprandial plasma glucose mg/dL                | 267.10   | 103.60  | 6.00    | 95-783   |
| Hemoglobin A1c %                                 | 8.73     | 2.42    | 0.15    | 4.5-24.6 |
| white blood cell countÍ10³μ/L                    | 7.02     | 2.12    | 0.28    | 2.9-13.5 |
| Red blood cell counts Í10¹²/L                    | 4.85     | 0.69    | 0.09    | 3.49-6.75|
| Hemoglobin g/L                                   | 12.66    | 1.54    | 0.21    | 8.8-16.3 |
| Mean corpuscular Hemoglobin pg/cell              | 28.69    | 8.93    | 1.33    | 17.7-76.9|
| Mean cell volume fl                              | 78.76    | 12.88   | 1.85    | 28.1-94.3|
| Red blood cell distribution width %              | 14.53    | 2.63    | 0.43    | 11.8-24  |
| Platelet count Í10⁹/L                            | 253.36   | 55.16   | 8.31    | 149-386  |
| Cholesterol mg/dL                                | 169.25   | 45.48   | 2.74    | 73-319   |
| Low density lipoprotein mg/dL                    | 94.88    | 48.2    | 3.25    | 27-505   |
| Triglycerides mg/dL                              | 172.20   | 102.89  | 6.19    | 38-887   |
| High density lipoprotein mg/dL                   | 46.34    | 16.86   | 1.13    | 24-178   |
| Blood urea nitrogen mg/dL                        | 16.44    | 6.81    | 0.56    | 7-61     |
| Creatinine mg/dL                                 | 2.83     | 3.04    | 0.22    | 0.7-9.6  |
| Glomerular filtration rate mL/min/m²             | 58.36    | 37.99   | 2.90    | 5.01-194.2|

Table 7. glucose statistics and target in patients with DM
| Variables                                      | Frequency (%) |
|-----------------------------------------------|---------------|
| **Pre-prandial capillary plasma glucose N= 352** |               |
| Hypoglycemia (level 1)                        | 3 (0.9)       |
| Under target range                            | 5 (1.2)       |
| Target range (80–130 mg/dL)                   | 85 (22.3)     |
| High plasma glucose                           | 259 (68)      |
| **Postprandial capillary plasma glucose N=298**|               |
| Target range (<180 mg/dL)                     | 64 (16.8)     |
| High plasma glucose                           | 234 (61.4)    |
| **Hemoglobin A1C N=220**                      |               |
| Target range <7%                              | 39 (10.2)     |
| Above 7%                                      | 181 (47.5)    |

Table 7. Medications were recommended to registered patients.
| Drug                                      | Frequency (%) |
|-------------------------------------------|---------------|
| **Insulin**                               | 147 (38.6)    |
| LANTUSâ                                   | 74 (19.5)     |
| NovoRapidâ                                | 67 (17.6)     |
| NovoMix®                                  | 45 (11.8)     |
| Toujeo®                                   | 15 (3.9)      |
| Apidra®                                   | 11 (2.9)      |
| LEVEMIR®                                  | 9 (2.4)       |
| **Oral**                                   | 312 (81.9)    |
| Metformin                                 | 208 (54.6)    |
| Gliclazide                                | 93 (24.6)     |
| Zipmet® (Metformin +Sitagliptin)           | 73 (19.2)     |
| Acarboz                                   | 66 (17.3)     |
| GlibenClamide                             | 35 (9.2)      |
| GloRipa® (Empagliflozin)                  | 31 (8.1)      |
| Ropixon® (Rosuvastatin)                   | 11 (2.9)      |
| Others                                    | 51 (13.5)     |
| **Combination Therapy**                   |               |
| One oral agent                            | 123 (32.3)    |
| Two oral agents                           | 127 (33.3)    |
| Three oral agents                         | 54 (14.2)     |
| Four oral agents                          | 8 (2.1)       |
| One type insulin                          | 72 (18.9)     |
| Two type insulin                          | 75 (19.7)     |
| Basal Insulin + one oral agent            | 40 (55.6)     |
| Basal Insulin + two oral agents           | 20 (27.8)     |
| Basal Insulin + three oral agents         | 5 (6.9)       |
| Basal Bolus Insulin + one oral agents     | 20 (26.7)     |
| Basal Bolus Insulin + two oral agents     | 6 (8)         |
| Basal Bolus Insulin + three oral agents | 1 (1.3) |