INTRODUCTION

Diabetes mellitus is a metabolic disorder of multiple etiologies, characterized by chronic hyperglycemia.\(^1\) It has emerged as a major health problem in India.\(^2\) It is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease. This number is expected to increase to 79.4 million by 2030.\(^3\) The crude prevalence rate in urban areas of India is apparently 9% and in rural areas of Karnataka, this rate is 5.8%.\(^4\) The most common form of diabetes is type 2 diabetes where 95% of patients with diabetes are having this type.\(^5\)

ABSTRACT

**Background:** To study the Pattern of drug prescribing, utilization, analyse effectiveness of different therapies and factors influencing medication failure and adherence to treatment among diabetics.

**Methods:** The clinical study was conducted in JJM Medical College and Karuna Trust, Davangere, Karnataka. The patients with diabetes as diagnosed by consultant physician were observed for the pattern of blood glucose control. The fasting blood glucose of the patients were recorded at the end of 1st month, 6th month and 12th month of their treatment period. The study period was from June 2012 till August 2014. The study was conducted after institutional ethical clearance and informed consent was taken from all the patients. The pattern of drugs prescribed for the patients were also analysed. The pattern of control among patients with co morbidities were also analysed using paired sample t-test.

**Results:** The results showed that the prescribed drugs were able to control the blood glucose levels of the patients. The percentage of patients with FBS in controlled, mild to moderate control and uncontrolled group were 21%, 33.3% and 45.5% in early treatment period and 36%, 40.9%, and 22.7% after one year treatment period (Significant p value). The pattern of drug utilization showed that the most commonly used drugs were the combination of pioglitazone+glimipride+metformin (19%), combination of glibenclamide+metformin (18%), only insulin (9%), combination of glimipride+metformin (8%) and combination of gliclazide+metformin (5%).

**Conclusions:** The results show that the intervention by the consultant physician was successful in controlling the blood sugar levels and the reasons for failure of treatment and adherence to treatment were helpful for further treatment of patients. Further such studies in a larger sample will help the consultants in their treatment methods.

**Keywords:** Diabetes, Drug utilization, Observational study, Prescription pattern
areas approximately 3% of the total population. Global prevalence of diabetes in age groups 20-79 years in 2011 was 8.3% and projected rise 9.9% in 2030. As per the International Federation of Diabetes number of people with diabetes till 2011 were 366 million and projected to rise 552 million in 2030 with maximum increase in India.  

Drug utilization has been defined as the marketing, distribution, prescription, and use of drugs in a society, with emphasis on the resulting medical and social consequences. DUS is an essential part of pharmacoepidemiology. The principal aim of drug utilization studies (DUS) is to facilitate the rational use of drugs in population, also describes the nature and drug exposure, and may also help to identify non-adherence problems. Non adherence and poor follow ups are the main factors responsible for poor glycemic control with high risk of development of long term micro and macrovascular complications. Hence the present study was undertaken with aim of providing relevant and useful feedback to physicians. By doing these prescribing pattern studies we could provide feedback to prescribers and assures quality medical care. The current study also attempts to analyze the current prescription patterns of drugs used in the treatment of both type 1 and type 2 diabetes mellitus patients.

METHODOLOGY

The clinical study was conducted in JJM Medical College and Karuna trust, Davangere, Karnataka. The patients with Diabetes as diagnosed by consultant physician were observed for the pattern of blood glucose control. The fasting blood glucose of the patients were recorded at the end of 1st month, 6th month and 12th month of their treatment period. The study period was from June 2012 till August 2014. The study was conducted after institutional ethical clearance and informed consent was taken from all the patients. Blood sugar level of less than 130 mg%, 130-200 mg% and above 200 mg% were grouped as level of control 1, 2 and 3 respectively. The FBS1 FBS2 and FBS3 are fasting blood sugar levels at the end of first month, at the end of 6 months and at the end of 12 months. The reasons for uncontrolled were collected based on the questionnaire answered by the patients. The pattern of drugs prescribed for the patients and pattern of control among patients with co morbidities were analyzed using paired sample t test.

Inclusion criteria

- Patients of either sex, irrespective of their socioeconomic status background.
- Patient with newly diagnosed Type 1 and Type 2 diabetes as diagnosed by physician.
- Patient with glycosylated haemoglobin of more than 6.5%.

Exclusion criteria

- Patients with gestational diabetes
- Patients with diabetic complications
- Patients who are not willing to give consent

RESULTS

The results showed that the prescribed drugs were able to control the blood glucose levels of the patients. The percentage of patients with FBS in controlled, mild to moderate control and uncontrolled group were 21%, 33.3% and 45.5% in early treatment period and 36%, 40.9%, and 22.7% after one year treatment period. (Significant p value). The pattern of drug utilization showed that the most commonly used drugs were the combination of pioglitazone+glimipride+metformin (19%), combination of glibencamide+metformin (18%), only insulin (9%), combination of glimepiride+metformin (8%) and combination of glimepiride+metformin (5%).

**Table 1: Medications given.**

| Medications                          | Frequency | %   |
|-------------------------------------|-----------|-----|
| Glibenclamide+metformin             | 18        | 27.3|
| Gliclazide+metformin                | 5         | 7.6 |
| Glipizide+metformin                 | 4         | 6.1 |
| Pioglitazone                        | 2         | 3.0 |
| Glimipride+metformin                | 8         | 12.1|
| Pioglitazone+glimipride+metformin   | 19        | 28.8|
| Only insulin                        | 9         | 13.6|
| Pioglitazone+metformin              | 1         | 1.5 |
| Total                               | 66        | 100.0|

**Table 2: Reasons for uncontrolled FBS levels.**

| Reasons                                | Patients |
|----------------------------------------|----------|
| Controlled                             | 17       |
| Unknown reasons                        | 22       |
| Followup irregularity                  | 8        |
| Non-compliance due to side-effects     | 4        |
| Illitry, medication unawareness, lack of diet control | 6 |
| Polypharmacy, comorbidities            | 8        |
| Habits-tobacco chewing, smoking        | 1        |
| Total                                  | 66       |
was glimepiride+metformin combination with 12% of patient (Table 1). At the beginning of the treatment we had 30 patients (45%) in uncontrolled group, 23 patients (34.8%) in controlled group and at the end of 1 year treatment we had only 18 patients (27%) in the uncontrolled group (Table 2). On applying Chi square test p value was significant (P<0.01) (Table 3). On comparing the means of FBS1 (fast blood sugar level at the end of one month) and FBS3 (Fasting blood Sugar Level at the end of 12 month), mean for FBS1 was 206 and for FBS3 was 171.6 and mean difference was 33.42 and P value was significant (P ≤0.01).

Table 3: Level of control 1* level of control 2 cross tabulation.

| Level of control (FBS1) 1 month | Level of control (FBS2) 6 months | Total |
|---------------------------------|---------------------------------|-------|
|                                 | 1.00               | 2.00               | 3.00               |
| No. (%)                         | No. (%)            | No. (%)            | No. (%)            |
| 1.00 (<130mg)                   | 7 (53.8)           | 6 (46.2)           | 0 (0.0)            | 13 (100.0) |
| 2.00 (130-200mg)                | 7 (30.4)           | 13 (56.5)          | 3 (13.0)           | 23 (100.0) |
| 3.00 (>200mg)                   | 4 (13.3)           | 11 (36.7)          | 15 (50.0)          | 30 (100.0) |
| Total                           | 18 (27.3)          | 30 (45.5)          | 18 (27.3)          | 66 (100.0) |

FBS1-at one month of treatment, FBS2-at end of 6 months of treatment, Level of control 1.00 <130mg%, 2.00-130-200mg%, 3>200mg%

Table 4: Paired sample T test comparing means.

|                  | Mean | N   | Std. deviation | Mean difference | t    | df  | P value |
|------------------|------|-----|----------------|-----------------|------|-----|---------|
| Pair 1           |      |     |                |                 |      |     |         |
| FBS1             | 206.6061 | 66  | 95.72282       |                 |      |     |         |
| FBS3             | 171.6667 | 66  | 60.57477       | 33.42424        | 3.124| 65  | .003    |

DISCUSSION

Diabetes mellitus (DM) is an important public health problem in developing countries.6 The important threats to health and life that beset the person with diabetes are cardiovascular disease (CVD), cerebrovascular and peripheral vascular disease.7 The associated co-morbid conditions seen with diabetes mellitus are hypertension, dyslipidaemia, neuropathy, nephropathy and retinopathy. About 20-60% of diabetic patients are associated with hypertension as a co morbid condition.8 In present study, most of the patients were stabilized with a combination of triple drug combination including pioglitazone, metformin and glimepiride. These are combination of sulfonylurea (an insulin secretogogue) and insulin sensitizers (biguanide and thiazolidinedione both acting by different mechanisms). Similar results were observed in Panikar et al studies.9 About 27.3% of patients in our study had combination of glibenclamide and metformin as second most commonly used medication with better glycemic control. Kannan et al studies had the similar combination as most common prescribing pattern in tertiary care centre in Tamilnadu.10

Poor Medication adherence (PMA) is a commonly seen in long term non-communicable diseases such as diabetes. PMA is associated with escalation of treatment costs and clinical outcomes.11 Patient having depression, blind beliefs and medicinal costs were attributed to PMA in Polonsky studies.12 In our study the main factors which led to poor adherence were unknown reasons, follow-up irregularity, noncompliance for adverse reactions and medication ignorance. Polypharmacy and addiction to smoking and alcohol were also minor factors which influenced the outcome of our study. The unknown reasons may be depression or distress altering the patient’s perception of diabetes and their willingness to actively manage their own health.11 Future research on a larger patient population is warranted to evaluate existing patterns of therapy for sound practice and quality of care.

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