

## Insulin Prescription Pattern among Type 2 DM patients visiting Outpatient Department at a Tertiary Hospital in Kathmandu, Nepal

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### Abstract

**Background:** Management of Type 2 Diabetes Mellitus includes non-pharmacological and pharmacological interventions of which insulin remains one of the most effective methods for achieving glycemic control, either alone or in combination with oral anti-diabetic medications. Effective usage of insulin in the management of glycaemia remains a challenge in developing countries like Nepal. To best of our knowledge, there is not any study regarding insulin prescription pattern on Type 2 Diabetes Mellitus patients using insulin from Nepal, so we studied the prescription pattern of insulin on insulin using Type 2 Diabetes Mellitus patients.

**Methods:** Patients aged 30 years or above who present in Dhulikhel Hospital outpatient clinic during the period from January 2015 to June 2015 with diagnosis of Type 2 Diabetes Mellitus diagnosed at least for 6 months and were taking injection insulin at least since last 3 months were enrolled in this cross sectional, observational study.

**Results:** Forty-five study participants had a mean age of  $56.6 \pm 10.95$  year, body mass index of  $23.97 \pm 4.72$  kg/m<sup>2</sup>, Diabetic duration of  $10.33 \pm 6.41$  years and HbA1c of  $8.53 \pm 1.53\%$ . Fifty-three percent were female and almost all study participants (96%) were taking Oral Antidiabetic Drugs along with Insulin. Sixty-three percent of participants were using Premix insulin whereas 33% were using basal insulin alone. Mean Insulin dose was  $28.96 \pm 11.75$  units per day. Among them, 80% were "self" injecting insulin and 53% were using Glucometer.

**Conclusion:** Our data showed that premixed insulin being most commonly used insulin. All patients used Insulin Pen as delivery device and larger proportions of them were self injecting insulin. All patients felt mild hypoglycemia which can be improved by increased utilization of glucometer.

**Keywords:** hypoglycemia; insulin; T2DM

### INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disorder characterized by prolonged hyperglycemia due to inadequate insulin secretion or defective insulin action or both. It is estimated that, more than 70% of people with diabetes will reside in developing countries by 2030.<sup>1</sup> Achieving good glycemic control has important role in reducing the burden of disease attributable to diabetes mellitus.<sup>2</sup>

Management of DM includes non-pharmacological and pharmacological

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interventions of which insulin remains one of the most effective methods for achieving glycemic control, either alone or in combination with oral anti-diabetic medications.<sup>3,4,5</sup> According to recent estimates, nearly 40% patients with T2DM in India and Gulf countries are using insulin alone or in combination with OADs at any given point of time.<sup>6, 7</sup> There is one study on prescription pattern in DM patients attending outpatient clinic of a tertiary hospital from Nepal documenting 15% were using insulin.<sup>8</sup> Effective usage of insulin in the management of glycaemia remains a challenge in developing countries like Nepal. Proper insulin administration can also prevent

many of the adverse outcomes associated with it especially hypoglycemia, lipodystrophy, rash.<sup>9</sup>

To best of our knowledge, there are not any study regarding insulin prescription pattern and assessing hypoglycemia on DM patients using insulin. Thus this study was performed to assess the prescription pattern and hypoglycemic awareness on insulin using type 2 diabetic patients.

## METHODS

This was a cross sectional study done in patients aged 30 years or above who present in Dhulikel Hospital outpatient clinic with diagnosis of Type 2 Diabetes Mellitus diagnosed at least for 6 months and were taking injection insulin at least since last 3 months from January 2015 to June 2015. Patients with any major illness, surgery, or diabetic ketoacidosis in last 6 months, use of glucocorticoids, post-transplant diabetes, and gestational diabetes were excluded. This study was approved by Institutional Research Committee of Kathmandu University.

Sampling methods, technique and sample size calculation

A questionnaire form was made and patients were asked their demographic information including name, sex, age, marital status, educational level, smoking and alcohol history. Physical examination was done at the time of enrollment including measurement of height, weight, and blood pressure. For blood pressure measurement, patients were asked to do rest at least for 5 minutes and taken two blood pressure measurements consecutively at 5 minutes interval and taken mean value as patients BP. Information about diabetic history, diabetic complications and medical treatments were assessed. Lastly, recent laboratory results of fasting plasma glucose (FPG), HbA1c, LDL level were recorded. Lab results of previous 30 days (fasting blood lipid and HbA1c results within 3 months) were accepted for the study.

Chi-square test was used to compare qualitative variables, if this was inappropriate then nonparametric test was used. For quantitative variables, Tests of normality was done and found that all such variables were not distributed normally. Nonparametric test (2 independent sample test) was used for such variables. P <0.05 was considered statistically significant. All data were analyzed using SPSS 20.

## RESULTS

In this cross-sectional study, 150 diabetic patients were enrolled. The mean age of the patient was 56.6 years (SD: 10.95). Fifty-three percent of the patients were female. The mean Diabetes duration was found to be 10.33 years (SD: 6.41). The mean HbA1c was 8.53% (SD: 1.53). Variables are tabulated on Table 1.

Table 1. Clinical parameters of study participants

Variables	n; Mean ± SD
Age (years)	56.6 ± 10.95
DM Duration (years)	10.33 6.41
BMI (kg/m <sup>2</sup> )	23.97 4.72
FBS (mg/dl)	137.88±49.56
HbA1C (%)	8.53 ±1.53
Variables	n (%)
Gender, n (%) Male	21 (46.66)
Female	24 (53.33)
Education, n (%)	
Below SLC	21 (46.6)
Intermediate	16 (35.6)
Bachelor and above	8 (17.8)
Known case of Dyslipidemia	21 (46.7%)
Known case of Hypertensive	15 (33.33%)

The proportion of patients according to age group is shown in Figure 1, whereas Figure 2 illustrate according to diabetic duration; with almost half were having diabetic duration more than 10 years.

## % of patients

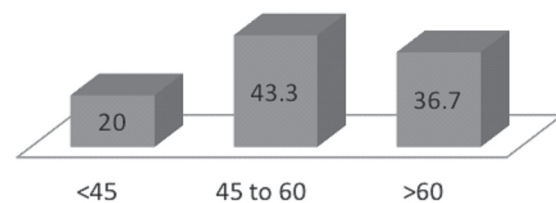


Figure 1: Bar diagram showing % of patients according to age distribution

### % of Patients

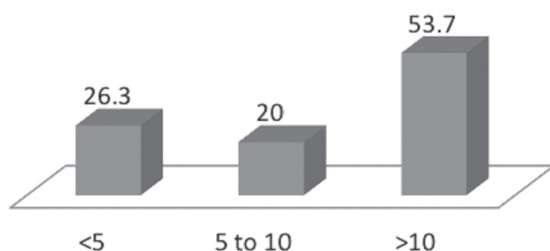


Figure 2: Bar diagram showing percentage of patients according to Diabetic Duration distribution

### % of Insulin

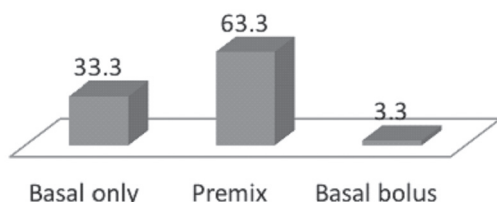


Figure 3: Bar diagram showing percentage of insulin prescription regimen

In this study, most common form of insulin prescription was Premix insulin as seen in Figure 3. Only one patient was prescribed basal bolus regimen. One third of patients was prescribed Analogue insulin whereas Regular insulin being the most common type of insulin as described in Figure 4. Mix subgroup shown in Figure 4 meaning premix insulin formed with combination of short acting analogue insulin and NPH insulin whereas Regular subgroup meaning premix insulin formed with combination of short acting regular insulin and NPH.

### % of Patients

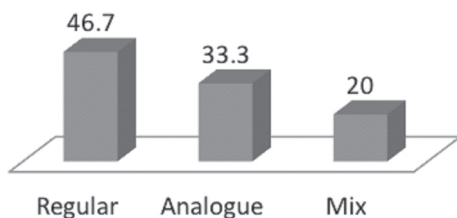


Figure 4: Bar diagram showing percentage of insulin prescription based on its type

Table 2. Treatment characteristics of insulin treated T2DM patients.

Variables	n (%)
Medication regimen	
Insulin alone	9 (20)
Insulin and OAD	36 (80)
Insulin Pen as insulin delivery device	
Yes	45 (100)
No	0 (0)
Self Insulin Injection	
Yes	36 (80)
No	9 (20)
Using Glucometer	
Yes	24 (53.3)
No	21 (46.7)
Self-Reported Hypoglycemia symptoms,	
Yes	45 (100)
No	0 (0)
Variables	n; Median SD
Insulin (Unit/day)	28.96 11.75
Insulin Duration (months)	12.10 10.41

### DISCUSSION

The mean age and diabetes duration were similar to the baseline data from other studies,<sup>10-12</sup> one being a multinational prospective observational study (MOSAIC) addressing similar issues amongst T2DM patients on insulin with or without OADs.<sup>11</sup> In our study, 53% of participants are female, similar with Chinese cohort of MOSAIC but higher comparing to Indian cohort, which could be due to referral bias. Education status of our patients is also comparable to other studies,<sup>10, 11</sup> more than fifty percent of them had graduated High School, which is 57% in Indian cohort of MOSAIC. In our study, mean  $\pm$  SD HbA1c was  $8.53 \pm 1.53$  %, comparable with recently conducted DiabCare Asia trials in India and Gulf countries showing  $8.9 \pm 2.1$  % and  $8.3 \pm 2.0$  % respectively.<sup>13, 14</sup>

Eighty percent of our study participants were using insulin along with OADs which is similar with Indian and Saudi Arabian cohort of MOSAIC.<sup>11</sup> Other studies<sup>10, 15</sup> showing higher rate of sole insulin usages. Higher usages of OADS along with insulin in our study may be acknowledging the pathophysiology of T2DM as proposed by Ralph A DeFronzo.<sup>16</sup>

Nearly 2/3rd of our patient were prescribed premix insulin (human or analog), aligning with evidences from previous real world data, epidemiological surveys, and consensus statements of key opinion leaders.<sup>10, 13, 17, 18</sup>

Our patients were prescribed slightly higher analog insulin similar with Indian study documenting 10 years audit of insulin injection practices.<sup>10</sup> In our study, 46.7% used only human insulin, 33.30% used only analog insulin and 20% used both regular and analogue insulin. The comparative figures for human versus analog were 71% versus 32% in the DiabCare India study,<sup>13</sup> 68.3% versus 31.7% in the Japanese GP study<sup>19</sup> and 26% versus 85% in DiabCare Gulf study.<sup>14</sup> Such variations of choice may have been influenced by many factors, among them socioeconomic conditions, affordability, availability being main player.

TDD of insulin (U/day) was 28.96 ± 11.75 in our study, which was similar to Indian audit of Insulin Injection Practices<sup>10</sup> and DiabCare India survey<sup>13</sup> which reported 33.36 ± 18.34 and 32.1 ± 17.0 respectively. While the DiabCare Gulf study<sup>14</sup> used higher mean daily dose (U/day) of 57.5 ± 30.4, their Japanese GP study<sup>19</sup> reported relatively lower dose of 25.8 ± 22.9 U/day. Such finding may indicate racial variations in daily requirement of insulin in addition to a different pattern of practice amongst practitioners of a particular country or region.

In our study, all patients used insulin pen device, in concordance with Chinese (100%) and Germany (95%) cohort of MOSAIC study.<sup>11</sup> In Indian audit of Insulin Injection Practices<sup>10</sup> pen device was used by 66.08% of the patients, whereas 31.76% patients used insulin syringes, and 2.15% were using both Insulin pen as well as syringes. Similarly, In DiabCare India study 65.6% used pens, 32.0% used syringes.<sup>13</sup> Data from a recent large worldwide survey indicated that insulin pen alone was used by 85.6% of patients, while 9.6% used a syringe alone, 2.8% used both, and 1.4% used a pen and another device (usually an insulin pump).<sup>20</sup> Thus, it seems economic condition is an important, but not the sole factor responsible for, physicians or patients choice and familiarity in using modern devices during insulin therapy also may have important role. In this study, 80%

were self injecting insulin, similar with Nigerian Study.<sup>12</sup>

The American Diabetic Association (ADA) has recommended SMBG using glucometer in all diabetic patients on insulin.<sup>13</sup> However, almost half of our study patients did not have access to glucometer despite being on insulin therapy. Other studies from developing countries like India<sup>10</sup> reported that one third of patients were not using glucometer while Nigerian<sup>12</sup> and Pakistani study<sup>21</sup> reported 56% and 59% of Type 2 Diabetic patients were utilizing glucometer respectively.

In this study, all patients reported mild form of hypoglycemia, similar with an Indian study conducted among 366 Type 2 Diabetic Patients where 96% reported hypoglycemic symptoms.<sup>22</sup> A met analysis involving 532,542 People with Type 2 Diabetes on Oral Therapies and Insulin reported that prevalence of mild/ moderate hypoglycemia was 50%<sup>23</sup> whereas Nigerian study [12] reported it among 65% patients. In contradiction, only 7.6% of participants reported hypoglycemia in Indian audit of Insulin Injection Practices.<sup>10</sup>

## CONCLUSIONS

Our data showed that premixed insulin being most commonly used insulin. All patients used Insulin Pen as delivery device and larger proportions of them were self injecting insulin. All patients felt mild hypoglycemia which can be improved by increased utilization of glucometer.

The one limitation of this study is that the sample size was small and it was study done in single hospital setting.

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## CONFLICT OF INTEREST

The Author disclosed that there is no conflict of interest in publishing this research paper.

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