International Journal of Medicine Research
ISSN: 2455-7404; Impact Factor: RJIF 5.42
Received: 20-01-2019; Accepted: 24-02-2019
www.medicinesjournal.com
Volume 4; Issue 2; April 2019; Page No. 67-71

Study of knowledge regarding insulin and injection technique, hypoglycemia and its management among the diabetes patients: A study from single Centre

Dr. Chandrakant Bhaskar[1], Dr. Sachin Chittawar[2], Dr. TN Dubey[3]
[1] Resident, Department of Medicine, Gandhi Medical College, Bhopal, Madhya Pradesh, India
[2] Associate Professor, Department of Endocrinologist, Gandhi Medical College, Bhopal, Madhya Pradesh, India
[3] Professor and HOD, Department of Neurologist, Department of Medicine, Gandhi Medical College, Bhopal, Madhya Pradesh, India

Abstract
Background: Insulin remains the mainstay of treatment in diabetes and about 3.2 million Indians depend on insulin injections for the management of diabetes
Aims and Objectives: To assess knowledge regarding Insulin and Injection technique, hypoglycemia and its management at Home in Diabetic Patients.
Materials and Methods: One hundred and fifty diabetic patients were studied the Department of Medicine OPD at in Hamidia Hospital Gandhi Medical College Bhopal Madhya Pradesh between a period of August 2016 to September 2018. Patients were interviewed with a questionnaire assessing their knowledge on insulin injection technique and hypoglycemia.
Results: Majority were in the age group of 27-37 years (30.5%) with female preponderance (56%). Majority of the people used the syringe as device for insulin injection (94.67%), 76.67% people have the education of insulin injection technique, 64.67% people occasionally missing the insulin dose, 74.67% people takes insulin before meal, 44.67% people takes meal after 30 minutes of taking injection, 58% subjects rotate vial/pen before use, 87.33% people did not used the spirit for cleansing the site of injection, 11.33% people uses injection after drying the spirit, 60.67% people changes their injection site, 51.33% people changed the injection site weekly, 36.00% people preferred arm as injection site, 67.33% people never inspected any abnormality at injection site, 82% people did not inspected any lip hypertrophy at injection site, 52.67% of people inject at 90 degree angle, 73.33% people fold the skin before injection, 80.67% people do not rub skin after injection, 78% people kept needle inserted for 5 sec, majority of the people do not withdraw needle partly (94.67%), 61.33% people store insulin at room temperature, 55.33% people missed the insulin injection while travelling, 82.67% people change the needle in greater than 2 days, 82.67% people reuses the needle to save the money, 84.67% disposes the needle in garbage, 84% people do not adjust the insulin by themselves, 97.33% people do not inject through clothes, 84.67% people do not have knowledge of 40IU and 100IU insulin, 71.33% people have knowledge of hypoglycaemia, 72% people do not take the precaution for hypoglycaemia, 78.67% of people do not have glucometer, 90.67% of people do not have knowledge about mixing of insulin, only 11(7.33%) patients have the knowledge about the SICK day management, No patients were doing routine check up of injection site by professionals. 71.33 % patients did not get their injection site ever being checked, whereas 28.67% visit the doctors only when they found any problem at injection site and 80% people rarely checked their blood glucose by themselves.
Conclusion: We found significant gap with respect to insulin delivery recommendation through syringes/pen and current insulin injection practice.

Keywords: knowledge, injection technique, insulin, site rotation

1. Introduction
An alarmingly rising prevalence of diabetes has been reported in recent years in India. According to current studies, 67 million Indians are suffering from diabetes. By 2030, the prevalence of diabetes among Indians is expected to reach 87 million [1].
Insulin remains the mainstay of treatment in diabetes and about 3.2 million Indians depend on insulin injections for the management of diabetes [2]. Many people with type 2 diabetes and all with type 1 diabetes need insulin for survival, and intensive insulin therapy is recommended in them. However, the incorrect technique of injecting insulin may increase the risk of poor glycemic control, due to mismatch of peak insulin effect and maximal glucose load [3].
The efficacy of injection therapy in diabetes depends on correct injection technique. To provide patients with guidance in this area and help patients inject themselves correctly, we must understand how they currently inject; therefore, the purpose of this study was to assess the current situation of insulin injection technique in patients with diabetes. Incorrect insulin injection technique on a global scale is a common phenomenon, such as incorrect rotation of the injection site and needle reuse. It has been observed from various studies till now that these problems, to some degree, affected the effect of insulin therapy, eventually leading to poor glucose control, may it be hypoglycemia or hyperglycemia.
Research in the different part of the world showed that the

knowledge and practice of insulin therapy among diabetics is very poor. Until now, few published guidelines have been available to help health professionals and their patients effectively execute these therapies. In this study, we try to assess the awareness regarding insulin injection practice and knowledge of patients regarding outcomes of faulty injection techniques and related complications like hypoglycemia among diabetics in the Indian scenario.

Materials and Methods

Present observational cross-sectional study was performed on 150 patients of type 1 and type 2 diabetes mellitus coming to Medicine and endocrine OPD in Hamidia Hospital Gandhi Medical College Bhopal Madhya Pradesh between a period of August 2016 to September 2018

Patients who were on insulin injection for at least three months were included. They had been interviewed with a questionnaire assessing their knowledge on insulin injection technique and hypoglycemia. In case of patients less than 6 years of age, their parents has been interviewed in presence of Child.

The assessment of insulin injection technique has been done by Assessing injection device type, missed dosages, timing of injections, the number of injections per day, the injection sites where using the skin fold technique (pinch-up) and rotation of injection site, needle entry angle, whether area disinfected prior to injection, the time the needle remains under skin, needle reuse, storage of insulin vials, extra precautions while travelling for insulin, sharps disposal, abnormality at injection site assessed by 'Observing at injection sites' including insulin leakage, bleeding and bruising, lip hypertrophy at injection sites. The data on lip hypertrophy has been obtained through visual examination and palpation.

The assessment of hypoglycemic awareness among these patients were assessed by their current knowledge of symptoms of hypoglycemia which includes – most commonly sweating, Confusion Dizziness (blackouts), Feeling shaky, Hunger, Headaches, Irritability, Pounding heart; racing pulse(tachycardia), Pale skin, Trembling, Weakness, Anxiety. Also their knowledge regarding availability of different strength insulin vials and use of insulin syringes/pen accordingly were assessed. Also their knowledge about SICK day rules were assessed.

Diabetic patients on Insulin Injection for less than three months, patients not able to understand Hindi or English language, visually impaired patients and patients having cognitive dysfunction were excluded from present study.

After due consideration of inclusion and exclusion criteria, an informed consent has been taken for being in study. A detailed history and clinical examination has been done in all subjects in this study.

The data obtained is subjected to statistical analysis with the consult of a statistician. The data so obtained are compiled systematically. A master table is prepared according to the Questionnaire and the total data was analyzed using MS Excel and presented as individual tables along with graphs.

Results

Most of people were of age group of 27-37 years (30.5%). Majority were (56%) females.

Table 1: Showing different characteristic of study cohort

Variable		No of patients	Percentage
Device used for Insulin Injection	Syringe	142	94.67
	Insulin Pen	8	5.33
	Insulin Pump	0	0
Education of Insulin injection technique	Yes	115	76.67
	No	35	23.33
Missing of dosages	Never	0	0
	Often (several times a week)	14	9.33
	Sometimes (several times a month)	39	26.00
	Occasional (several times a year)	97	64.67
Timing of injection	After meal	0	0
	Before meal	112	74.67
	Don't know	38	25.33
Timing between Injection & Meal	After 10 minutes	22	14.67
	After 15 minutes	50	33.33
	After 30 minutes	67	44.67
	After 1 hour	11	7.33
Rotation of vial/pen before use	Yes	87	58
	No	63	42
Cleansing injection site with spirit	Yes	19	12.67
	No	131	87.33
Time gap between cleansing & injection	Immediately	4	2.67
	After drying	17	11.33
	Not applicable	129	86.00

Table 2: Showing different characteristic of study cohort (contd…)

Variables		No of patients	Percentage
Changing site of injection	Yes	91	60.67
	No	59	39.33
Frequency of site change	Daily	10	6.67
	Weekly	77	51.33
	Sometimes	62	41.33
	Never	1	0.67
Preferred site of injection	Abdomen	28	18.67
	Arm	54	36.00
	Thigh	47	31.33
	Buttocks	0	0
	Combination of sites	21	14.00
Inspect abnormality at injection site	Sometimes	49	32.67
	Always	0	0
	Never	101	67.33
Inspect lipohypertrophy at injection site	Yes	27	18.00
	No	123	82.00
Angle of injection	45 degree	71	47.33
	90 degree	79	52.67
Skin folding before Injection	Yes	110	73.33
	No	40	26.67
Skin rub after Injection	Yes	19	12.67
	No	121	80.67
	Occasional	10	6.67
Duration of needle Insertion	5 sec	117	78.00
	10 sec	10	6.67
	> 10 sec	10	6.67
	I don't know	4	2.67

In present study majority of the people do not withdraw needle partly (94.67%), 61.33% people store insulin at room temperature, 55.33% people missed the insulin injection while travelling, 82.67% people change the needle in greater than 2 days, 82.67% people reuses the needle to save the money, 84.67% disposes the needle in garbage, 84% people do not adjust the insulin by themselves, 97.33% people do not inject through clothes, 84.67% people do not have knowledge of 40IU and 100IU insulin, 71.33% people have knowledge of hypoglycaemia, 72% people do not take the precaution for hypoglycaemia, 78.67% of people do not have glucometer, 90.67% of people do not have knowledge about mixing of insulin, only 11(7.33%) patients have the knowledge about the SICK day management, No patients were doing routine checkup of injection site by professionals. 71.33 % patients did not get their injection site ever being checked, whereas 28.67% visit the doctors only when they found any problem at injection site and 80% people rarely checked their blood glucose by themselves.

Discussion

Studies from different countries showed that diabetes knowledge is generally poor among the diabetic patients [4, 5]. Correct insulin injection technique is crucial for betterglycemic control [6]. However, our study showed significant gaps between insulin delivery recommendations and current insulin injection practice.

In present study most of patients were in the age group of 27-37 years (30.5%) and maximum (56.0%) of the patients were female. Gawand *et al*. cross sectional, observational, KAP (knowledge, attitude and practice) survey of 56 T1DM and T2DM patients reported that mean age of study population was 39.48± 3.49 years and majority of patients were males (64.29%) [7]. In a similar study by Tanjia *et al.* who studied 202 diabetes patients reported that maximum patients were (51.98%) were male and majority of them (67.82%) has an age range of 40-60 years [8]. Poudel *et al.* in a similar study of 43 patients who were using insulin pen reported that the median age of the participants was 55 (49–63) years and similar to present study majority (55.8%) of them were females [6].

In present study maximum (94.67%) patients used the syringe as device for insulin injection. Gawand *et al.* reported that all the patients were confident about self-administering insulin using syringes [7].

In present study maximum (44.67%) patients took meal after 30 mins after taking injection. Poudel *et al* found that median time gap between injection and meal was 15 (15–30) minutes [6]. The guidelines recommend maintaining an injection-meal interval of 30 min when injecting regular insulin in abdomen and 45 min in other injection sites [9]. However, there are studies which have shown no change in HbA1c level with variation in injection-meal time [10].

In present study maximum (87.33%) patients did not used the spirit for cleansing the site of injection. Gawand *et al* reported that majority of patients (72.42%) didn't clean the injection site before hand while none of them withdrew syringe partly to check for presence of blood [7].

In present study maximum (60.67%) patients were changing their injection site and maximum (51.33%) patients changed the injection site weekly. Gawand *et al*. Reported that all the patients rotated injection sites [7]. Poudel *et al*. reported that cleaning of the injection site before insulin administration was not practiced by 30 (69.8%) participants. Poudel *et al.* also reported that 30 out of 43 patients (69.8%) were known to rotate the injection sites while injecting insulin [6].

In present study maximum (36.00%) patients preferred Arm as the most common injection site. Gawand *et al*. reported that out of 56 patients, 40 patients (71.43%) injected insulin on upper arm, 16 patients (28.57%) on abdomen while only 3 patients (5.36%) injected in thigh [7]. The thigh was the most common site of injection of insulin (19, 44.2%) followed by abdomen (16, 37.2%) and using both sites (thigh and abdomen) (8, 18.6%) in a report of poudel *et al* who studied 43 insulin taking patients [6]. Others studies also reported the abdomen and thigh as most common sites of injection [11].

In preset study maximum (52.67%) of patients injected at 90 degree angle. In agreement to present study Poudel *et al.* studied 43 patients who were taking insulin through the insulin pen and reported that 34 (79.1%) patients injected insulin at nearly 90° angle [6].

In present study maximum (73.33%) patients fold the skin before injection. Poudel *et al* studied 43 diabetes patients and showed that nearly three quarters of the patients made a skin fold while injecting the insulin [6].

It is recommended that the injection site should not be massaged after injection. In present study maximum (80.67%) patients did not rub the skin after injection. Poudel *et al.* found that about one in five patients (9, 20.9%) mentioned that they massage the injection site after administration of insulin [6].

In present study maximum (78%) patients kept needle inserted for 5 sec. In agreement to present study Poudel *et al* reported that while studying 43 diabetes patients that nearly half of the patients or their relatives (20, 46.5%) stated that they wait less than 5 seconds after completely inserting the thumb bottom before withdrawing insulin needle from the skin [6]. The guideline suggests that patients should count slowly from 1 and reach 5 to 10, depending on the dose of insulin, after completely pushing the thumb bottom before the withdrawal of the needle from the skin [9]. A higher dose of insulin may also contribute to longer transit time of insulin [12]. Therefore, some patients may need to count past 10, especially when giving higher doses. This is necessary to prevent medication leakage and to get the full dose.

Maximum (61.33%) patients stored insulin in use at room temperature. However Gawand *et al*. reported that all patients kept the insulin in refrigerator [7]. Clarity is required whether the insulin which was kept in the refrigerator was in use or not in use insulin. The insulin pen in use (insulin cartridge inside) can be stored at room temperature (15–25°C) for 30 days [9]. The storage of insulin (regular and biphasic) at 32°C and 37°C for 28 days has shown 14–18%reduction in the potency of insulin [13] Similarly, opened (in-use) cartridge should not be refrigerated when installed in insulin pen [14]. It has been known that variation in temperature leads to accumulation of air in the pen which inversely affects insulin delivery at its predefined time [15]. The comparatively better option would be either storing in-use insulin pen in an earthen pot or in a cooling bag. But it has been recommended that needle should not be reused [9].

In present study maximum (82.67%) patients changed the needle in greater than 2 days. Poudel *et al* reported that all the patients (n=43) were known to use a single needle more than once for injecting insulin and the median number of single needle use was 16 (12–30) times [6]. Anational survey in India reported that 92.5% patients reused pen needle for

at least 2 times to more than 10 times [11]. Another study reported that Indian patients with DM used each needle for an average of six times to inject insulin [16]. The most common reasons for the reuse of needles were to save money and for convenience. Making needles cheaper or distributing needles to patients free of cost can be useful means to overcome this problem. In agreement to that in present study maximum (82.67%) patients were reusing the needle to save the money.

In present study maximum (84.67%) patients disposed the needle in garbage. In agreement to present study Poudel *et al*. found that out of 43 patients just about half of the participants reported that they disposed their needles in the dustbin and then transferred them to the municipal waste disposal vehicle [6]. Almost all patients disposed used needles improperly in our study. The most common methods included transfer of used needles to municipal waste disposal vehicles, throwing them in isolated places, and burning. These situations are a clear indication of lack of awareness on needle disposal together with absent of regulatory requirement. Similarly, majority of the Indian patients were known to throw the needle and syringes directly into the garbage and public drainage system [9].

Maximum (84%) patients do not adjust the insulin by themselves and maximum (97.33%) patients do not inject through clothes. In present study maximum (84.67%) patients do not have knowledge of 40 IU and 100 IU insulin. Reports of Gawand *et al*. showed that only 16 patients (28.57%) out of 56 were aware of different types of insulin and 8 patients (14.25%) could specify about different insulin delivery devices [7].

In present study maximum (71.33%) patients have knowledge of hypoglycemia and maximum (72%) patients did not take the precaution for hypoglycemia. Gawand *et al*. reported that out of 56 patients, 45(80.36%) patients could mention symptoms of hypoglycaemia, while majority of patients 39(69.64%) didn't carry simple carbohydrates while travelling [7]. Gawand *et al*. reported that although more than 80% patients enumerated hypoglycaemic symptoms, very few patients carried simple carbohydrates while travelling (35.71%) which was much carefully followed by patients in KAP study of a Bijapur (67.1%) [17]. These aspects of practice needs further evaluation and emphasis.

Reports of Tanjia *et al*. showed that out of maximum 202 diabetes patients, 88.61% participants had an idea about the symptoms of hyperglycemia and 59.9% participants claimed that they had knowledge about the symptoms of hypoglycemia. Tanjia *et al*. also reported that carbohydrate intake was the major way to control hypoglycemia by the study population (around 44.05%). But about 50.49% of the participants were not concerned about their hypoglycemia management [8].

In present study maximum (80%) patients rarely checked their blood glucose by themselves and maximum (78.67%) of patients do not have glucometer. However, a similar study reported that the use of modern practice like glucometer for home blood glucose monitoring was absent [7]. This is particularly significant as guidelines from western countries clearly recommend self-monitoring of blood glucose in insulin users [7]. Tanjia *et al*. revealed that around 62.38% study population never used self-testing instrument for blood sugar and among them 78.22% claimed that they did not know how to read the result. A few claimed self-testing is too expensive (2.97%) and too painful (2.97%) [8].

In present study maximum (90.67%) of patients do not have knowledge of mixing insulin. Not mixing or inadequate mixing of premix insulin can alter the insulin concentration and vary the clinical response. Also, it has been associated with higher consumption of insulin. In a similar study by Poudel *et al*. reported that out of 30 patients using premix insulin, just 12 (40% of 30) patients were mixing the insulin before administration but only five (41.7% of 12) patients mixed the insulin properly [6].

Doctors plays important role in providing Diabetes Mellitus health information among the participant. Contrary to that in present study, no patients were doing routine checkup of injection site at the visit to professional. (71.33 %) patients were not able to remember the site of injection ever being checked, whereas (24%) visit the doctors only when they found any problem at injection site. Tanjia *et al*. showed that about 99% participants out of 202, claimed that they always attend DM clinic/doctor for follow up [8]. Tanjia *et al*. also reported that majority of the study population (71.78%) claimed that they visit health care provider more than twice in a year and only 0.49% participants said that they never visited health care provider [8].

Conclusion

Results of present study have revealed a significant gap with respect to insulin delivery recommendation through syringes/pen and current insulin injection practice followed by study subjects. Proper education and counseling on proper insulin syringe/pen injection technique should be provided to patients with diabetes on insulin. There was also a lack of proper knowledge about Hypoglycemia and its home remedies among study subjects, which could be overcome by educating Diabetes patients on insulin about symptoms of Hypoglycemia and its home remedies.

References

1. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of type 2 diabetes: Indian scenario. Indian J Med Res. 2007; 125:217-30.
2. Funnell MM. Lessons from DAWN: Implementing effective insulin therapy. Int J Adv Nurs Pract. 2009; 10:2.
3. Crasto W, Jarvis J, Khunti K, Davies MJ. New insulins and new insulin regimens: A review of their role in improving glycaemic control in patients with diabetes. Postgrad Med J. 2009; 85:257-67.
4. Al-Maskari F, El-Sadig M, Al-Kaabi J M, Afandi B, Nagelkerke N, Yeatts KB. Knowledge, attitude and practices of diabetic patients in the United Arab Emirates. Plos One. 2013; 8(1):e52857.
5. Al-Adsani AM, Moussa MA, Al-Jasem LI, Abdella NA, Al-Hamad NM. The level and determinants of diabetes knowledge in Kuwaiti adults with type 2 diabetes. Diabetes Metab. 2009; 35(2):1210-128.
6. Poudel RS, Shakti Shrestha, Rano Mal Piryani, Bijaya Basyal, Kalpana Kaucha, Shital Adhikari. Assessment of Insulin Injection Practice among Diabetes Patients in a Tertiary Healthcare Centre in Nepal: A Preliminary Study. Journal of Diabetes Research. 2017; 2017:1-6.
7. Gawand KS, Gawali UP, Kesari HV. A Study to Assess Knowledge, Attitude and Practice Concerning Insulin use in Adult Patients with Diabetes Mellitus in Tertiary Care Centre. 2016; 3(9):36-40.
8. Tanjia N, Fannana T, Naved MA, Sultana S. Assessing

the Knowledge, Attitude and Practice of Diabetes Mellitus among Diabetes Patient in Dhaka City, Bangladesh. J Pharm Chem Biol Sci. 2016; 4(1):64-75.
9. Frid AH, Kreugel G, Grassi G. New Insulin Delivery Recommendations, Mayo Clinic Proceedings. 2016; 91(9):1231-55.
10. Baker E, Ahmed A, Badgandi M, Home PD. Interval between insulin injection and meal in relation to glycatedhaemoglobin. Practical Diabetes International 2001; 18(2):51-6.
11. Kalra SA, Sahay MR. Indian injection techniquestudy: population characteristics and injection practices, Diabetes Therapy. 2017; 8 (3):637-57.
12. Jamal RS. Ross A, Parkes JL, Pardo S, Ginsberg BH. Role of injection technique in use of insulin pens: prospective evaluation of a 31-gauge, 8-mm insulin pen needle, Endocrine Practice. 1999; 5(5):245-50.
13. Vimalavathini R, Gitanjali B. Effect of temperature onthe potency & pharmacological action of insulin, The Indian Journal of Medical Research. 2009; 130(2):166-9.
14. Upadhyay DK, Palaian S, Prabhu M, Shankar PR, Mishra P. Insulin glargine. Journal of Institute of Medicine. 2008; 30 (1):72-77.
15. Ginsberg BH, Parkes JL, Sparacino C. The kinetics of insulin administration by insulin pens, Hormone and Metabolic Researce. 1994; 26(12):584-7.
16. Patil M, Sahoo J, Kamalanathan S. Assessment ofinsulin injection techniques among diabetes patients in atertiary care centre. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 2016, 1-6.
17. Priyanka Raj CK, Angadi MM. Hospital-based KAP study on diabetes in Bijapur, Karnataka. Indian J Med Spec. 2010; 1:80-3.