

Knowledge of Diabetic Patients about Insulin Injection Technique

Muhammad Sajid Mehmood¹, Muhammad Wajad Munir², Sana Sehrish³, Naila Sardar²
Department of Physiology^{1*}, Department of Radiology³, Poonch Medical College, Rawalakot, AJK,
Department of Medicine, Al-Nafees Medical College and Hospital², Islamabad.

Present address: ^{*}Department of Physiology, Frontier Medical College, Abbottabad.

Abstract

Background: Diabetes mellitus is leading cause of morbidity and mortality worldwide mainly due to macro and microvascular complications.

Objective: To assess the knowledge of insulin injection technique among diabetic patients.

Study type, settings and duration: It was a cross sectional study carried out at the Pakistan Institute of Medical Sciences, Islamabad for 06 months.

Methodology: A total of 260 diabetic patients between age 20 to 50 years and on insulin therapy for >02 years were enrolled in the study. Written informed consent was taken. The patient's knowledge was categorized as "Adequate" or "Inadequate" on the basis of score. Data was entered and analyzed by using SPSS version 22 software.

Results: The mean ($\pm$ SD) age of all patients was 36.8 ($\pm$ 8.5) years. Out of 260 patients, 150 (57.3%) patients were female and 138 (53.1%) were living in urban areas. Majority of patients, 141 (54.2%) received knowledge regarding insulin injection technique from doctors and 98 (37.7%) received knowledge from family members or friends. Out of 260, only 64 (24.6%) patients had adequate knowledge, while 196 (75.4%) patients had inadequate knowledge score.

Conclusion: One quarter of the patients has adequate knowledge about insulin injection techniques. Based on our findings, there is a need to conduct awareness campaigns at the community level to impart useful knowledge about diabetes and its various aspects like insulin injections techniques.

Key words: Diabetes, insulin syringe, knowledge of injecting insulin, Insulin syringe.

Introduction

Diabetes mellitus (DM) is known as one of the key reasons of death and debility worldwide. Most of morbidity and mortality is due to its macro and microvascular complications. According to American Diabetic Association, DM is a set of metabolic disorders characterized by means of hyperglycemia due to deficiencies of insulin

secretion, its action or both. The long term hyperglycemia is linked with dysfunction, and failure of various organs, affecting the nerves, blood vessels, eyes, heart, and kidneys.¹

DM is widely prevalent disease with an increasing incidence worldwide. Pakistan is among top 10 countries globally where diabetes mellitus is prevalent.² The occurrence of new cases of DM is 15.1% in males and 6.8% in females in urban areas, while 5.0% of male and 4.8% of female population is affected in rural areas in Pakistan.³

Hyperglycaemia is a collective effect of uncontrolled DM and over the period of time it leads to serious damage to the several body's systems, specifically the nerves and vessels.⁴ Untreated DM can result in many complications. The important short term complications include diabetic ketoacidosis and hyperosmolar hyperglycemic state.⁵ The long-term hyperglycemia of DM is associated with dysfunction, damage and failure of various organs, specifically eyes, kidneys, heart, nerves, and blood vessels.⁶

Corresponding Author:

Muhammad Sajid Mehmood
Department of Physiology
Poonch Medical College, Rawalakot, AJK.
Email: dr.saji111@gmail.com

Received: 08 January 2018, **Accepted:** 27 June 2019,
Published: 28 June 2019

Authors Contribution

MSM, MWM, SS & NS conceptualized the project & did the drafting, revision & writing of manuscript. MWM, SS & NS also did the Data collection. MSM & MWM performed the literature search. Statistical analysis was done by MSM & NS.

Education about DM has been well-acknowledged as an indispensable tool for the management and prevention of diabetes mellitus.⁷ Insulin plays a vital role in the treatment of DM. There is no fixed dose of insulin that is effective for each patient, the dose of insulin fluctuates, depending on patient's glycemic index and the type of insulin used. The adjustments are tailored throughout the life of individual as required.⁸

The precise technique of insulin injection is as important to ideal glycemic control as is the dose and type of insulin delivered. Improper techniques and choice of sites could alter insulin absorption, subsequently leading to variation in peak insulin effect. This may result in unexpected hyperglycemia. Moreover, it may also result in escalated risk of nocturnal hypoglycemia.⁹

In 2011 A. Surendranath-et al revealed that approximately 70% of the patients had inadequate awareness about insulin injection techniques; and remaining 30% of them had moderately adequate knowledge.¹⁰ Blood glucose control fluctuates with the technique used for insulin injection. There has been great focus on ideal insulin regimens for enhanced blood sugar control; however, little attention has been paid regarding, how to inject insulin correctly for improved blood sugar control and prevention of complications. The first genetically-engineered, synthetic "human" insulin was made using bacteria *E. coli* by Arthur Riggs and Keiichitakura in 1978. The massive majority of insulin available worldwide is this biosynthetic recombinant "human" insulin or its analogues.¹¹ Rissanen and Partanen have proposed that the technique of the administration of injection is just as important to ideal glycemic control as is dose and type of insulin.¹²

The current study was carried out to assess the level of knowledge about insulin injection techniques in diabetic patients and to scrutinize the common error in injecting techniques.

Methodology

A descriptive cross sectional study was conducted from March to August, 2016 after the approval from ethical review board of Shaheed Zulfiqar Ali Bhutto Medical University/ Pakistan Institute of Medical Sciences, Islamabad (PIMS).

Diabetic patients between age 20 to 50 years and on insulin therapy for >02 years visiting emergency and medical OPD of PIMS were in the inclusion criteria for the current study.

Patient was said to be diabetic if his/her fasting blood sugar level was $\geq 126\text{mg/dl}$ and 02 hour plasma glucose level $\geq 200\text{mg/dl}$ after 75 g oral

glucose tolerance test or random plasma glucose level $\geq 200\text{mg/dl}$ and symptoms of hyperglycemia or HbA1c $\geq 6.5\%$.

A total of 260 diabetic patients fulfilling the inclusion criteria, were enrolled after obtaining informed consent. The data were collected on a structured questionnaire, especially, designed for this study. Score was awarded for each question and the total score was 12. Diabetic patients who scored ≥ 9 were considered to have adequate knowledge while those with score ≤ 8 had inadequate knowledge. Data were entered and analyzed using SPSS version 20 software.

Results

A total of 260 patients were enrolled. The mean (SD) age of all patients was 36.8 (± 8.5) years, and ranged from 20 to 40 years. Out of 260 patients, 69 (26.5%) patients were between the age of 20 to 30 years, 94 (36.2%) were between 31 and 40 years of age and 97 (37.3%) were aged between 41 to 50 years. Out of the all, 150 (57.3%) patients were female and 138 (53.1%) lived in urban areas. Out of 260, 81 (31.2%) patients were illiterate and 70 (26.9%) patients had education up to matric level while, 129 (49.6%) patients were jobless/ housewives and 88 (33.8%) were professionals. One hundred thirty four (51.5%) patients were taking twice daily insulin regimen, 161 (61.9%) patients were on insulin therapy for ≥ 05 years and 154 (59.2%) patients had family history of diabetes mellitus. Majority 141 (54.2%) of patients, received knowledge about the technique of insulin injection from doctors and 98 (37.7%) received this knowledge from a family member or a friend (Figure-1). The mean ($\pm$ SD) score was 7.2 (1.5). The median knowledge score was 7. Minimum knowledge score was 3 while the maximum score

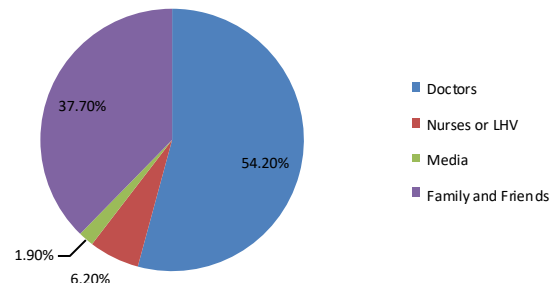


Figure 1: Source of knowledge about technique of insulin injection.

Out of 260, 64 (24.6%) patients had adequate knowledge score (9 and above) while 196 (75.4%) patients had inadequate knowledge score (8 and less). More educated patients (graduate and postgraduate) had adequate knowledge compared to less educated patients (matric and below) (Figure-3). Furthermore, urban patients had better knowledge compared to rural patients, laborers and jobless patients had low knowledge compared to others.

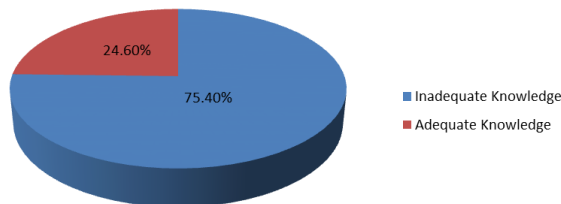


Figure 2: Knowledge Score categorization.

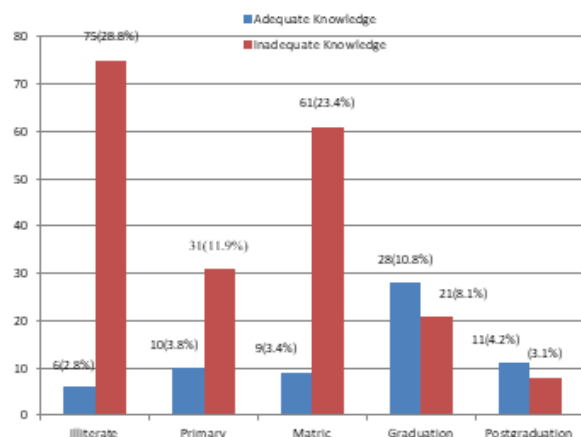


Figure 3: Patient educational status and insulin injection technique.

Discussion

Diabetes mellitus is one of the most important causes of mortality and morbidity, affecting about 384 million individuals worldwide comprising 8.3% of the total adult population.¹³ It was the eighth principal cause of death during 2012 and 2013. It has been estimated that 1.5 to 5.1 million deaths occur per year as a result of DM.¹⁴ It can be computed in a way that 'a person dies with diabetes every 6 seconds'.¹⁵

Most of the morbidity and mortality among diabetic patients is due to its acute and chronic complications. The risk of developing microvascular complications resulting from DM depends not only on

the duration but also the severity of hyperglycemia. In the United States, diabetic nephropathy is the principal cause of renal failure. Cerebro Vascular Disease (CVD) is the major cause of mortality in people with either type 1 or type 2 diabetes. In fact, CVD accounts for the highest health care expenditures borne by the diabetic patients.^{16,17} The individuals suffering from Type-2 DM are at a much higher risk (150-400%) of CVA. In recent times, the teaching of individuals to cope with their DM has been considered as an integral part of their clinical management. Insulin has pivotal role in the management of diabetes. The insulin therapy demands a close coordination and understanding by both the DM patient and the diabetic care-giver. There has been no definite insulin dosage specific for a distinct patient, hence, insulin treatment must be individualized to fit the life style and metabolism of the individual and may need day to day adjustments.⁸

In the present study the highest number of subjects¹⁸ were aged between 41 to 50 years followed by 94 (36.2%) subjects between 31 and 40 years of age.¹⁹

This study also showed that the adequacy of knowledge about insulin injections techniques was higher among educated patients. The result of our study are comparable to other studies carried worldwide.²⁰ Urban patients had better knowledge than rural patients. These results are consistent with other studies conducted in Pakistan.²¹ Professional patients also have higher scores than the laborers and jobless patients. Most of diabetic patients having adequate score took information from doctors. Our results are comparable to many studies from Pakistan and around the world.^{22, 23}

A study conducted in India by Surendernath et al. during 2011 and another study among Nigerian community attending world diabetic day 2012, conducted by U.S Jasper et al yield quite similar result as that of our study.¹⁰

A study conducted in Lahore, Pakistan on knowledge and awareness of insulin injections techniques among trained qualified nurses, revealed that out of 272 nurses, only 40 have knowledge of all the steps regarding the insulin injection technique. The information that insulin might be injected 30 minutes prior to meal was known to 57.4% and 66.2% have the knowledge of injecting insulin in the subcutaneous tissue, 64% knew that insulin might be injected in upper arm. Seventy five percent have an idea that it may be injected in upper thigh. Almost 90% of the nurses have an idea that insulin may be inoculated in the abdomen. The technique of pinching skin was correct in 64% nurses. Moreover, 56.6% had knowledge that cleaning the skin with spirit is not required.

Practically, the technique of injection was correct in 73% of the nurses and 90% gave it correctly at an angle of 90°. ²⁴

To conclude, our study showed that only one quarter of the patients had adequate knowledge about insulin injection techniques. Based on our findings, there is a need to conduct awareness campaigns at the community level to impart useful knowledge about diabetes and its various aspects like insulin injections techniques. There are many ways to improve knowledge regarding insulin therapy. A brochure or pamphlet with pictorial illustrations could be given to the patient visiting diabetic clinics and out-patient department to improve the techniques of insulin administration. Furthermore, there is also need to conduct further studies to explore more about it.

Acknowledgement

We are thankful to Dr. Jawad Khan and Dr. Saif ur Rehman who helped in critical review of manuscript also belonged to Frontier Medical College, Abbottabad.

Conflict of interest: None declared.

References

1. American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care* 2010; 33: s62- s9.
2. Khan MU. Lifestyle Modification in the Prevention of Type II Diabetes Mellitus. *Oman Med J* 2012; 27: 170-1.
3. Zia A, Kiani AK, Bhatti A, John P. Genetic Susceptibility to Type 2 Diabetes and Implications for Therapy. *J Diabetes Metab* 2013; 4: 248.
4. American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care* 2012; 36: S67-S74.
5. Kitabchi A, Umpierrez G, Miles J, Fisher J. Hyperglycemic Crises in Adult Patients With Diabetes. *Diabetes Care* 2009; 32(7): 1335-43.
6. American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care*. 2011;35(Supplement_1):S64-S71.
7. Hakeem R, Fawwad A. Diabetes in Pakistan: Epidemiology, determinants and prevention. *J Diabetol* 2010; 3: 4.
8. Kahn RG, Weir GC, King GL, Jacobson AM, Moses AC, Smith RJ. *Joslin's Diabetes Mellitus*. 14th ed. Boston: lippincott William wilkins publications; 2008.
9. Strauss K, Gols H, Hannet I, Partanen T, Frid A. A pan-European epidemiologic study of insulin injection technique in patients with diabetes. *Pract Diabet Int* 2002; 19(3): 71-6.
10. Surendranath A, Nagaraju B, Padmavathi GV, Anand SC, Fayaz P, Balachandra G . A Study to Assess the Knowledge and Practice of Insulin self-administration among patients with diabetes mellitus. *Asian J Pharmaceut Clin Res* 2012; 5(1): 63-6.
11. Aggarwal SR. What's fueling the biotech engine-2011 to 2012. *Nat Biotechnol* 2012; 30(12): 1191-7.
12. Partenen T, Rissanen A. Insulin Injection practices. *Practdiab Int* 2000; 17: 252-4
13. Yuankai S, Frank BH. The global implications of diabetes and cancer. *The Lancet* 2014; 383(9933): 1947-8.
14. L'Heveder R, Nolan T. International Diabetes Federation. *Diabet Res Clin Pract* 2013; 101(3): 349-51.
15. Beagley J, Guariguata L, Weil C, Motala A. Global estimates of undiagnosed diabetes in adults. *Diabet Res Clinl Pract* 2014; 103(2): 150-60.
16. Keenan H, Costacou T, Sun J, Doria A, Cavellerano J, Coney J et al. Clinical Factors Associated With Resistance to Microvascular Complications in Diabetic Patients of Extreme Disease Duration: The 50-year Medalist Study. *Diabetes Care* 2007; 30(8): 1995-7.
17. Gross J, de Azevedo M, Silveiro S, Canani L, Caramori M, Zelmanovitz T. Diabetic Nephropathy: Diagnosis, Prevention, and Treatment. *Diabetes Care* 2004; 28(1): 164-76.
18. DeWitt DE, Hirsch IB. Outpatient insulin therapy in type 1 and type 2 diabetes mellitus: scientific review. *JAMA* 2003; 289: 2254-64.
19. Becker J, Nora DB, Gomes I, Stringari FF, Seitensius R, Panosso JS, et al. An evaluation of gender, obesity, age and diabetes mellitus as risk factors for carpal tunnel syndrome. *Clini Neurophysiol* 2002; 113(9): 1429-34.
20. Basazn MA, Melaku GB, Asfaw ED, Taye HK, Melese BE. Knowledge and Self-Reported Practice of Insulin Injection Device Disposal among Diabetes Patients in Gondar Town, Ethiopia: A Cross-Sectional Study. *J Diabetes Res* 2016; 2016:1897517.
21. Sabri AA, Qayyum MA, Saigol NU, Zafar K, Aslam F. Comparing knowledge of diabetes mellitus among rural and urban diabetics. *McGill medicine Med* 2007; 10(2): 87-9.
22. Fatema K, Hossain S, Natasha K, Chowdhury HA, Akter J, Khan T, et al. Knowledge attitude and practice regarding diabetes mellitus among Nondiabetic and diabetic study participants in Bangladesh. *BMC Pub Health* 2017; 17(1): 364.
23. Rodrigues FFL, Zanetti ML, Santos MAd, Martins TA, Sousa VD, Teixeira CRdS. Knowledge and attitude: important components in diabetes education. *Rev Lat Am Enfermagem* 2009; 17: 468-73.
24. Mushtaq MA. Study of insulin injection technique amongst the nursing staff. *Pak J Med Sci* 2006; 22(3): 310-12.