http://ijnms.net/index.php/ijnms
e- ISSN: 2686-2123
p- ISSN: 2686-0538
ORIGINAL RESEARCH

EVALUATION OF ADHERENCE AND INSULIN INJECTION PRACTICES IN PEOPLE WITH TYPE II DIABETES MELLITUS

Mario Esau Katuuk[1], Gresty Natalia Maria Masi[2], Muhamad Nurmansyah[3]
Universitas Sam Ratulangi
Email : rioesau@unsrat.ac.id, ns.grestymasi@unsrat.ac.id, muhamad.nurmansyah@unsrat.ac.id

ABSTRACT

The practice of insulin injection in people with Diabetes Mellitus must be carried out appropriately and obediently by the patient for optimal regulation of glycemic control, preventing complications, and improving quality of life. This study was conducted to identify the description of insulin injection adherence and insulin injection practice in individuals with type 2 diabetes mellitus. This study was a quantitative research design with a cross-sectional approach using a questionnaire distributed to 32 respondents. The research was held at Club Prolanis Manado. Descriptive data analysis was conducted to describe the research variables. The findings showed that 100% of the respondents adhered well to insulin injections (Auto compliance > 80%), most respondents do not prime to check insulin flow and expel air before injecting insulin (78.1%), most respondents rotate the injection locations (75%), most respondents do not experience lipodystrophy (87.5%), more than half of the respondents experienced pain (53.1%), most of the respondents did not experience insulin leakage (81.2%), more than half of the respondents pinched during injection (56.2%), most of the respondents waited 10 seconds before removing the needle (75%). Skills and adherence in injecting insulin must be improved through continuous education and evaluation to achieve optimal glycemic control.

Keywords

Diabetes Mellitus Type 2, Insulin Adherence, Insulin Injection Practice

INTRODUCTION

Diabetes mellitus (DM) is a degenerative disease that has increased significantly yearly in the world and in Indonesia. Data from the International Diabetes Federation (IDF), in 2021, there will be around 537 million people in the age range of 20-72 years experiencing DM worldwide, which will increase to 783 million in 2045. This number does not include the undiagnosed group. IDF data shows that the prevalence of DM in Indonesia is around 10.2 million people. Indonesia is fifth among the ten countries, with around 19.5 million DM cases, which has increased from 2013 (International Diabetes Federation, 2017). North Sulawesi is ranked 4th in the province with the highest number of diabetics based on the 2018 RISKESDAS results (Kemenkes RI, 2018).

DM is a metabolic disorder characterized by hyperglycemia resulting from deficiencies in insulin production, abnormalities, and insulin resistance. Individuals with type 2 diabetes mellitus with poor glycemic control and severe

disease progression require exogenous insulin to regulate blood glucose levels (PERKENI, 2021). Insulin is a hormone that regulates blood glucose levels, enters cells for energy metabolism, and supports storing food reserves. The use of controlled and optimal insulin therapy can regulate blood glucose levels regularly, reduce the risk of complications, and achieve optimal glycemic control in combination with optimal meal planning.

Management of insulin therapy will have an optimal glycemic control effect if carried out regularly. Through education, diabetes mellitus patients are encouraged to carry out independent care, including insulin therapy, such as insulin injections. Patients are expected to be able to inject insulin independently (if possible) or assisted by family members in conditions with limitations. On the other hand, there are individuals with diabetes mellitus who intentionally delay or are disobedient in injecting insulin according to the correct dose and time for various reasons. The results of a study shows that medical costs, fear, confusion, feelings of failure, and helplessness trigger individuals with diabetes mellitus to delay or not inject insulin (Osborn et al., 2018). In addition, inaccuracies in insulin injections also impact the effectiveness of insulin work and the risk of complications of insulin therapy. Another study showed that 96.89% of respondents used insulin needles more than once with an average of six times, and 90% did not wait 5-10 minutes before removing the insulin needle (Patil et al., 2017). These data show that the practice of insulin injections is inappropriate. Identifying and evaluating adherence and insulin injection practices need to be done to understand the imprecision of insulin injection techniques. 89% of respondents used insulin needles more than once, an average of six times, and 90% did not wait 5-10 minutes before removing the insulin needle. This fact shows that the practice of insulin injections is inappropriate.

METHOD

This research used a quantitative research design with a descriptive study conducted in one of the Prolanis groups with a total sample of 32 people. Sampling was conducted using a purposive sampling technique on prospective respondents who met the inclusion criteria: type 2 DM patients with insulin therapy (basal, bolus, and basal-bolus), not undergoing anti-diabetic drugs combination therapy, and willing to become respondents. Retrieval of data using demographic questionnaires and respondent characteristics, evaluation of insulin injection techniques, and the Autocompliance method to evaluate adherence to insulin injections with the formula:

$$\frac{\textit{Total number of insulin injections}}{\textit{Total number of prescribed insulin injections}} \times 100\%$$

This research was carried out based on an assignment letter from the Institute for Research and Community Service at Sam Ratulangi University, number 630/UN12.13/LT/2022. Before taking the data, the researcher explained the study's purposes and process. Furthermore, the respondents needed to sign the consent form freely. Finally, the data was analyzed and presented in the distribution of frequencies of each category in the tables.

RESULTS

Table 1. Distribution of Respondent Characteristics

Category	Frequency	Percentage
Gender		
Man	5	15.6
Woman	27	84.8
Duration of Suffering DM		

< 10 years	17	53.1
≥ 10 years	15	46.9
Duration of Using Insulin		
< 10 years	26	81.2
≥ 10 years	6	18.8
Injection frequency per day		
1 time		
2 times	9	28.1
3 times	18	56.3
4 times	3	9.4
	2	6.3
Total	32	100

The results of the data analysis showed that most of the research respondents were female (27%), respondents who had diabetes were more in the category <10 years (53.1%), most respondents had been using insulin <10 years (81.2%), and more than half the number of respondents doing insulin injections two times per day (56.3%).

Table 2. Distribution of Respondents' Adherence with Insulin Injections based on the Autocompliance Method

Category	Frequency	Percentage
Compliant (≥80%)	32	100
Not compliant (< 80%)	0	0
Total	32	100

The results of the data analysis showed that all respondents were compliant in injecting insulin with an autocompliance score of ≥ 80%.

Table 3. Distribution of Priming before Insulin Injection

Category	Frequency	Percentage
Yes	7	21.9
No	25	78.1
Total	32	100

The results of data analysis showed that most of the respondents did not do priming to check the smoothness of insulin and expel air during insulin injection (78.1%).

Table 4. Distribution of Rotating Insulin Injection Locations

Category	Frequency	Percentage
Yes	24	75
No	8	25
Total	32	100

The results of data analysis showed that most of the respondents rotated or moved locations during insulin injections (75%).

Table 5. Lipodystrophy Frequency Distribution at Insulin Injection Sites

Category	Frequency	Percentage
Yes	4	12.5
No	28	87.5
Total	32	100

The results of data analysis showed that most of the respondents did not experience lipodystrophy in the insulin injection area (87.5%).

Table 6. Distribution of Pain Frequency during Insulin Injection

Category	Frequency	Percentage
Yes	15	46.9
No	17	53.1
Total	32	100

The results of the data analysis showed that more than half of the respondents experienced pain during insulin injections (53.1%).

Table 7. Distribution of Pinching During Insulin Injections

Category	Frequency	Percentage
Yes	14	43.8
No	18	56.2
Total	32	100

The results of the data analysis showed that more than half of the respondents pinched during injection (56.2%).

Table 8. Distribution of Leakage Frequency during Insulin Injection

Category	Frequency	Percentage
Yes	6	18.8
No	26	81.2
Total	32	100

The results of the data analysis showed that most of the respondents did not experience insulin leakage during injection (81.2%).

Table 9. Distribution held 10 seconds before withdrawing the needle

Category	Frequency	Percentage
Yes	28	75
No	4	25
Total	32	100

The results of data analysis showed that most of the respondents waited 10 seconds before removing the insulin needle (75%).

DISCUSSION

Adherence to insulin therapy impacts the glycemic control of individuals with DM (Schaper et al., 2017). The results of this study indicate that all respondents have high adherence to insulin injections, where all respondents show auto-compliance of more than 80%. This finding is different from another result which showed that 66.7% of the respondents showed insulin non-adherence (Despras et al., 2022). This condition can cause a glycemic imbalance. Insulin therapy in people with type 2 DM to meet the needs of insulin in the body to regulate blood glucose levels. Appropriate insulin therapy accompanied by patient compliance positively correlates with glycemic control, controlling the emergence of chronic complications and improving quality of life.

Correct insulin injection technique is one of the factors related to blood glucose control (Grassi et al., 2014). Research by Misnikova et al, proved that respondents in the intervention group who received training in insulin injection techniques demonstrated an increase in their ability to use proper insulin injection techniques, which was closely related to a decrease in A1C levels (Misnikova et al., 2017). Nevertheless, the results of this study show differences in insulin injection practices carried out by respondents with recommendations for the correct injection technique.

The majority of respondents in this study had yet to take the priming step in preparing insulin. Priming removes air in the pen and needle and ensures the needle functions properly (Kshanti et al., 2017). The same result was found in a study by Poudel et al., who stated that research respondents did not do priming before insulin injection, but only when changing cartridges or needles (Poudel et al., 2017). Priming is essential to avoid inaccurate insulin doses that enter the subcutaneous tissue.

This study found that most of the respondents rotated when injecting insulin. Recommendations for insulin injections must rotate in the injection area and change the area periodically. The recommended insulin injection areas are the abdomen, the upper 1/3 of the anterolateral thigh, the middle 1/3 of the posterior upper arm, and the upper lateral buttock area. Rotation is vital to prevent lipodystrophy and optimize the process of insulin absorption in the subcutaneous tissue. Therefore, educators must explain how to do rotations in a structured manner to individuals with diabetes mellitus and their families. The injection site is in one area with the distance

between one injection and the next injection, which is one cm or one finger. The injection site can be moved to another area weekly (Kshanti et al., 2017).

Furthermore, most respondents said they did not experience lipodystrophy in insulin injections. This information is consistent with the data that most respondents rotate when injecting insulin. Research conducted by Alhazmi et al., showed that 43% of respondents experienced lipodystrophy, which was related to an error in the insulin injection technique, namely how to rotate the insulin area incorrectly (Alhazmi et al., 2020). Subsequent research by Gorska-Ciebiada et al., showed that 63.5% of respondents rotated the injection area. Injection site rotation is essential to prevent lipohypertrophy (Gorska-Ciebiada et al., 2020). These complications can reduce insulin absorption by up to 25% and negatively affect the patient's glycemic control.

Another situation arises when insulin injections are a pain. The study results showed that the response was not much difference between the presence and absence of pain during insulin injections. A study result showed that more than 50% of respondents reported pain during insulin injections related to bleeding (Gorska-Ciebiada et al., 2020). Several factors are associated with insulin injection pain: injecting through clothing, cold insulin injection, and injection in lipohypertrophic areas, improper rotation technique, hypoglycemia, hyperglycemia conditions, high HbA1c levels, low BMI, younger age, and large insulin doses (Frid et al., 2016).

The results of this study showed that most respondents pinched when injecting insulin. Pinching or forming skin folds when injecting insulin ensures that insulin enters the subcutaneous layer to avoid entering the muscle layer (Hicks, 2008). As a result, insulin injected into the muscles can be absorbed more quickly, so the patients are at risk of experiencing hypoglycemia. The proper pinching technique: lifting the skin and subcutaneous tissue a few centimeters from the muscle with the thumb and forefinger or with the middle finger (Kshanti et al., 2017). The pinch is released after the insulin needle pull from the skin. The pinch technique optimizes insulin dosage and absorption in the body.

Insulin leakage is another problem that can occur when injecting insulin. However, this study's results showed that most respondents did not experience insulin leakage. Insulin leakage can occur when injecting large insulin doses or withdrawing the insulin pen immediately after all doses have been injected. This founding is consistent with other data; most respondents held the insulin needle for about 10 seconds after injecting all insulin doses. Research by Poudel et al. stated that more than 50% of respondents held the insulin pen for about 5-10 seconds after injecting a dose of insulin. This action must be done to prevent insulin leakage so that the injected dose is not reduced (Poudel et al., 2017).

Adherence to insulin therapy and proper injection technique is the target of DM management for patients with insulin. Health professionals are essential in providing education and training to patients and families. However, this research still needs more data collection and sample size. Therefore, it is necessary to research on a larger scale and more specific data related to insulin injection skills by direct observation of injection methods by patients and develop appropriate and measurable training methods for people with DM.

CONCLUSIONS

Most study respondents have demonstrated high levels of adherence to insulin therapy. Accordingly, the practice of injecting insulin has been carried out well by the majority of respondents. However, education and training on insulin injection techniques must be optimized by involving health workers and diabetes educators.

REFERENCES

Alhazmi, G. A., Balubaid, R. N., Sajiny, S., & Alsabbah, R. (2020). Assessment of Insulin Injection Technique Among Diabetic Patients in Makkah Region in Saudi Arabia. *Cureus*, *12*(9). https://doi.org/10.7759/cureus.10679

Despras, J., Guedj, A. M., Soula-Dion, S., Choukroun, C., & Leguelinel-Blache, G. (2022). Assessment of insulin adherence in diabetic outpatients: An observational study. *Annales Pharmaceutiques Françaises*, *80*(6), 827–836. https://doi.org/10.1016/J.PHARMA.2022.05.001

Frid, A. H., Hirsch, L. J., Menchior, A. R., Morel, D. R., & Strauss, K. W. (2016). Worldwide Injection Technique Questionnaire Study: Population Parameters and Injection Practices. *Mayo Clinic Proceedings*, *91*(9), 1212–1223. https://doi.org/10.1016/j.mayocp.2016.06.011

Gorska-Ciebiada, M., Masierek, M., & Ciebiada, M. (2020). Improved insulin injection technique, treatment satisfaction and glycemic control: Results from a large cohort education study. *Journal of Clinical and Translational Endocrinology*, *19*(December 2019), 100217. https://doi.org/10.1016/j.jcte.2020.100217

Grassi, G., Scuntero, P., Trepiccioni, R., Marubbi, F., & Strauss, K. (2014). Optimizing insulin injection technique and its effect on blood glucose control. *Journal of Clinical and Translational Endocrinology*, *1*(4), 145–150. https://doi.org/10.1016/j.jcte.2014.07.006

Hicks, D. (2008). Injection technique: To pinch or not to pinch? *Journal of Diabetes Nursing*, *12*(10), 364.

International Diabetes Federation. (2017). IDF Diabetes Atlas, 8th edition. Available at: https://www.diabetesatlas.org. In *IDF Diabetes Atlas, 8th edition*.

Kemenkes RI. (2018). Laporan Riskesdas 2018 Kementrian Kesehatan Republik Indonesia. In *Laporan Nasional Riskesdas 2018* (Vol. 53, Issue 9, pp. 154–165). http://www.yankes.kemkes.go.id/assets/downloads/PMK No. 57 Tahun 2013 tentang PTRM.pdf

Kshanti, I. A., Suhanah, Sudarsono, Suryadi, Wiyono, Suwandi, Ibrahim, Z. S., Handayani, S., Nuryati, Wibudi, A., Rochismandoko, Kurnia, N., Taruli, R. A., Asmi, & Arzarudin. (2017). Pedoman Teknik Menyuntik Insulin Indonesia. *The Indonesian Recommendations for Best Practice in Insulin Injection Technique*, 3.

Misnikova, I. V., Gubkina, V. A., Lakeeva, T. S., & Dreval, A. V. (2017). A Randomized Controlled Trial to Assess the Impact of Proper Insulin Injection Technique Training on Glycemic Control. *Diabetes Therapy*, *8*(6), 1309–1318.

https://doi.org/10.1007/s13300-017-0315-y

Osborn, C. Y., Sears, L. E., Hirsch, A., Raymond, J., Heyman, M., Head, R., & Dachis, J. (2018). Reasons for Insulin Omission—What Matters Most? *Diabetes*, *67*(Supplement_1), 889-P. https://doi.org/10.2337/db18-889-P

Patil, M., Sahoo, J., Kamalanathan, S., Selviambigapathy, J., Balachandran, K., Kumar, R., Vivekanandan, M., & Ajmal, K. (2017). Assessment of insulin injection techniques among diabetes patients in a tertiary care centre. *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*, *11*(2017), S53–S56. https://doi.org/10.1016/j.dsx.2016.09.010

PERKENI. (2021). Pedoman Petunjuk Praktis Terapi Insulin Pada Pasien Diabetes Mellitus 2021. *Pb Perkeni*, 32–39.

Poudel, R. S., Shrestha, S., Piryani, R. M., Basyal, B., Kaucha, K., & Adhikari, S. (2017). Assessment of Insulin Injection Practice among Diabetes Patients in a Tertiary Healthcare Centre in Nepal: A Preliminary Study. *Journal of Diabetes Research*, *2017*, 8648316. https://doi.org/10.1155/2017/8648316

Schaper, N. C., Nikolajsen, A., Sandberg, A., Buchs, S., & Bøgelund, M. (2017). Timing of Insulin Injections, Adherence, and Glycemic Control in a Multinational Sample of People with Type 2 Diabetes: A Cross-Sectional Analysis. *Diabetes Therapy*, *8*(6), 1319–1329. https://doi.org/10.1007/s13300-017-0317-9