Assessment of insulin treatment – related knowledge among nurses in Pediatric Hospitals

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Abstract : Introduction**:** Nurses have a major role in insulintreatment. The aim of thisstudywas to assess nurses' knowledge focusing on insulin treatment of children. For this purpose, a self-administered questionnaire was given to 67 nurses. Sociodemographic data were recorded. Results: Eighty percent of the sample answered that they have never been trained on the special care of people with diabetes,86.6% chose the method of coursesas the first method of training,67.5% answered correctly that the most serious complication of insulin therapy is hypoglycemia while 61% of the sample answered correctly that the complication of theinsulin injection is lipohypertrophy or lipodystrophy. Conclusions: There is a need for covering the gap of nurses' knowledge and practices related to insulin treatment.For achieving that aim, continuing nursing education focusing on insulin treatment is recommended.

***Keywords**–Assessment, insulin treatment, knowledge, nurses*

I. INTRODUCTION

Insulin is the basic treatment in order to control hyperglycaemia among patients suffering from diabetes mellitus [1]. Insulin is not only one of the most prescribed drugs in the hospital care settings, but, also, one of the potentially highly harmful, if not used properly. Health care professionals need to draw their attention to all areas relating to insulin treatment to achieve optimal glucose control in the blood. Additionally, insulin therapy is extremely complex due to the use of new insulin preparation's nowadays.

Nurses have the major role in administration of insulin and, also, the responsibility of identifying the suspicious signs of hyperglycaemia and hypoglycaemia. The Institute of Medicine (2004) stated that «nurses are the largest component of the healthcare workforce, and are also strongly involved in the commission, detection, and prevention of errors and adverse events» [2]. In addition, diabetes mellitus, as a health problem of chronic nature, requires awareness of nurses, training and up-to-date education. Inadequate knowledge of nurses on insulin treatment can cause errors and several adverse outcomes. Errors related to insulin treatment include problems with insulin administration timing, type as well as the route of administration) or injection technique. Therefore, nurses' level on insulin treatment knowledge must be high [3,4].

It is a challenge for nurses to cover the gap of insulin treatment knowledge so as to achieve better patient care [5].

Recent studies suggest that many nurses have inadequate levels of knowledge on accepted standards of diabetes care [6-8]. Wakefield & Wilson used scenarios and quizzes to assess nurses' knowledge on basal–bolus insulin pre and post online educational courses. The level of knowledge in intervention group was significantly increased after the educational intervention [4]. Two studies have demonstrated the need for improvement in general diabetes knowledge among nurses in community hospitals [9,10] while other studies in Europe and South Asia related to health professionals diabetes knowledge and insulin treatment have shown significant deficiencies [11-13]. According to Derr et al, prior studies of physicians, practitioners, and nurses have identified deficits in the knowledge of diabetes, while one study has focused on specific knowledge of insulin [6].

The identification of nurses' knowledge level on insulin therapy is crucial for patients with diabetes mellitus [5]. However, search of the literature did not reveal many studies focused on nurses' knowledge regarding the treatment with insulin. Several studies assessed the knowledge on diabetes among medical and nursing staff and the impact on patient outcomes. The introduction of the paper should explain the nature of the problem, previous work, purpose, and the contribution of the paper. The contents of each section may be provided to understand easily about the paper.

The aim of this study was to assessnursing staff's knowledgefocusing on insulin treatment of children.

II.   DESIGN AND METHODS

A descriptive study was carried out in which a questionnaire consisted of 38 items was used. Nurses answered the questionnaire during their shift in the Hospital.

The study was conducted in two Pediatric Hospital of Athens. Nurses were working in several clinical departments (Emergency Department, Surgery Clinic, Pediatric Clinic, Orthopedic Clinic, Ophthalmologic Clinic, Intensive Care Unit (ICU), Dialysis Unit (DU), Short Stay Unit and Premature Intensive Care Unit.

The study population consisted of 100 nurses who worked in the above Hospital(s). Response rate was 67% (67/100). Nurses were not specialized in Diabetes Care.

The questionnaire was created by the authors and consists of 38 items in total. The questionnaire xploresi)the frequency of nurses' education on protocols related to the care of children with diabetes mellitus (12 items), ii) the choices of educational method by nurses (6 items), iii) nurses' knowledge on implementation of insulin therapy (12 items),and iv) nurses' knowledge on implementation of insulin injection (8 items). Demographic data were, also, recorded.

Content validity of the scale was tested through the study of the international literature [18-20] by a group of professors in Nursing who confirmed that the structure and the content of the scale is satisfactory. A pilot study was carried out among 25 nurses to minimize any understanding problems.

For the statistical analysis IBM SPSS Statistics version 15 (SPSS Inc., 2004, Chicago, USA) was used. Quantitative variables are presented as mean (± standard deviation) while qualitative variables are presented as frequencies and percentages. The internal consistency of the scale was evaluated through Cronbach's a coefficient and found to be 0.75.

III.   RESULTS

Mean age of nurses was 34.01 (Standard Deviation ±7.2, Minimum 24, Maximum:53 while 89.2% were female and 10.8% male. Descriptive characteristics are presented in table 1.

Table 1 Descriptive characteristics of the sample

Demographic data	Frequency	Percentage (%)
Gender		
Female	60	89.2
Male	7	10.8
Educational level		
Secondary School	27	40.3
University	40	59.7
Retraining		
MSc	3	5.3
PhD	3	5.3
Pediatric Specialty	10	17.5
None	40	70.2
Other	1	1.8
Work experience (years)		
<5	26	39.4
6-10	16	24.2
11-15	10	15.2
>15	14	21.2
Clinical Department		
Outpatient clinic	7	10.4
Internal Medicine Departments	30	44.8
Surgical Departments	29	43.3
Age	**Mean**	**SD**
	34,01	±7.2
SD: Standard Deviation		

Table 2 shows the frequency of nurses' education on protocols related to the care of children with diabetes mellitus.

Table 2 Frequency of nurses' education on protocols related to the care of children with diabetes mellitus.

ITEMS	Yes (%)	No(%)
1. Training on special nursing care of patients with DM	20	80
2. Training on nursing care protocols in emergency department for the management of hypoglycemia caused by insulin	7.6	92.4
3. Implementation of nursing care protocols in emergency department for thetreatment of hypoglycemia.	17.2	82.8
4. Training on pediatric nursing care protocols for the implementation of insulin treatment in children	16.9	83.1
5. Implementation of pediatric nursing care protocols for insulin treatment	19	81
6. Training on nursing care protocols in emergency department for the management of ketoacidosis among children	15.9	84.1
7. Participation in the implementation of nursing care protocols for the management of ketoacidosis in children	16.1	83.9
8. Training on nursing protocols related to the management of hypoglycemia in school	4.8	95.2
9. Training of parents and children in implementation of insulin treatment in routine	18.8	81.3
10. Documentation of parents and children training protocols regarding the insulin therapy in clinical practice	3.2	96.8
11. Implementation training protocols to insulin therapy in clinical practice	17.5	82.5
12. Desire for training in organizing and implementing protocols of insulin therapy	84.1	14.3

A percentage of 86,6% chose courses as the first training method (Table 3).

Table 3 Choice of educational method of nurses

Educational Method	Order	Frequency	%
Courses	1st	58	86.6
Discussionwithspecialists	2nd	51	78.5
Discussion with professionals	3rd	51	78.5
Studying articles	4th	50	76.9
Learning through the work	5th	43	66.2
Learning through the patients	6th	41	63.1

Regarding the level of knowledge in the implementation of insulin treatment, 34, 3% of the sample consider as having lack of knowledge on complications caused by insulin treatment.

Table 4 Nurses' knowledge on implementation of insulin therapy

ITEMS	Right (%)	Wrong (%)	Do not know (%)
1. Which insulin is used for the treatment of IDDM today?	28.1%	50%	21.9%
2. At what temperature insulin is kept?	82%	9.8%	8.2%
3. How many insulin regimens are used today?	39.1%	26.6%	34.4%
4. What is the ideal ratio of normal and rapid-acting insulin at daily doses?	26.7%	15%	58.3%
5. What is the difference between "blurred" and "clear" insulin?	70.3%	20.3%	9.4%
6. How many hours the intermediate-acting insulin act totally?	39.1%	39.1%	21.9%
7. When the intermediate-acting insulin has the greatest effect?	12.5%	70,3%	17.2%
8. Which insulin therapy regimens are used in our country?	42.9%	33.3%	23.8%
9. In intensified insulin therapy regimen, how often should you check the blood glucose?	55.4%	32.3%	12.3%
10. In insulin therapy with insulin analog Lispro, the food is taken?	6.3%	42.2%	51.6%
11. In conventional insulin regimen, when food is taken?	9.4%	67.2%	23.4%
12. Which is the most serious complication of insulin therapy in the patient's everyday life?	65.7%	29.9%	4.5%
IDDM: Insulin Dependent Diabetes Mellitus			

Regarding the knowledge of nurses in implementing the injection of insulin, only 3.4% answered correctly that the characteristics of the needles of insulin syringes which are used in lean patients is the 31G x 5 mm without creating aspect. Also, only 7.6% answered correctly that the position of insulin injection is the abdomen (Table 5).

Table5. Nurses' knowledge on implementation of insulin injection

ITEMS	Right (%)	Wrong (%)	Do not know (%)
1. How many units of insulin are contained in a syringe of 1 ml?	83.3%	7.6%	9.1%
2. In thin patients, which characteristics of the needles of insulin syringes are used?	3.4%	50%	46.6%
3. In children aged 0-16 years old, which characteristics of the needles of insulin syringes are used?	10%	45%	45%
4. Note the point of the body into which the injection of insulin for better glucose control?	7.6%	92.4%	-
5. At which point of the body the absorption of insulin by subcutaneous injection is better?	37.7%	47.5%	14.8%
6. Which factors accelerate insulin absorption?	56.5%	17.7%	25.8%
7. Which factors can delay insulin absorption?	47.5%	19.7%	32.8%
8. Which are the complications of the insulin injection?	61%	25.4%	13.6%

IV.   DISCUSSION

This study was carried out in Athens region and targeted to assess knowledge of nurses on insulin treatment among 67 nurses from Children' Hospitals. The questionnaire was constructed in order to assess the knowledge of nurses in insulin treatment. Despite the adaptation of the investigative fields according to current knowledge about diabetes at the time the surveys were implemented -1983 and 1989 respectively-, in this study an additional adjustment of the content of the questions was carried out, according to the latest guidelines European Diabetes Association [14] and the American Diabetes Association[15]. The lack of knowledge about the care and daily nursing care of people with diabetes have been studied worldwide, but not in our country. Our study showed that 60.15% of the sample answered wrong in the area of insulin and 58.3% said they did not know important areas for insulin therapy related nursing knowledge.Additionally, only 39% of sampled nurses responded correctly to questions of knowledge and skills related to insulin therapy for children with diabetes. The 39.79% responded correctly to questions of knowledge and 38.37% responded correctly to questions skills. It was found that only one third or more of the sample had acceptable levels of knowledge and skills for the care of children with diabetes mellitus.

Regarding to theoretical knowledge of Insulin Dependent Diabetes Mellitus, only 18.9% of nurses believes that he has a lack of knowledge in this field while 20.9% in the area of skills.It seems that, even the knowledge level is low, nurses do not recognize the deficit.As far as their training in the care of people with diabetes is concerned, only 20% said they have trained. Furthermore, a percentage of 4.8% -17%has been trained in specific nursing care protocols for children with diabetes. At the same time, 84.1% would like to be trained in the organization and application of insulin treatment.Moreover, according to the study of Findlow [16] 94.8% wanted to be trained to insulin. In two studies [17, 18] researchers found that continuing education is required in diabetes. In addition, nurses who believed that they had knowledge of diabetes care, may were not aware of their lack of knowledge [19]. According to our results, nurses may not be mobilized in the search for new knowledge in the care of people with diabetes.It is likely that the most obvious barrier to the integrated current knowledge in diabetes care is due to the perception of nurses that the existing knowledge is sufficient and specific.

In addition, 74.1% of the sample answered wrong in the area of the application of the injection of insulin. Particularly, 82.56% replied that the injection is inclined   45˚ with the syringes specially built for injection insulin. The same was found in the study of Drass et al [17]. Particularly, 82% of the sample answered the wrong questions concerning the measurement of blood glucose and 72% answered wrong on the Somogyi phenomenon.

The results of this study and other similar studies [20,21] conclude that nurses do not have enough knowledge regarding care issues for children with diabetes mellitus and regarding the patient education on his everyday care.The increasing prevalence of Diabetes Mellitus leads to an urgent need for response of health professionals in the ever growing needs of people with diabetes in hospital [22].According to the guidelines from the European Society of Diabetes, the International Foundation diabetes and the American diabetes Association [4,5,6], specialized knowledge on IDDM of children and skills are required by nurses.The inadequate and inappropriate care on diabetes patients can lead to reduced knowledge of the patients. This could lead to undermined of the confidence of patients against nurses who cared for in hospital and thus to reduce the confidence of patients in the health system [23].Thus it is imperative to organize training programs to ameliorate the knowledge and skills of nurses on the care of people with diabetes. It is expected that well-organized

programs that use various forms of learning and teaching, can contribute to improving knowledge of nurses on issues related to the DM [24, 25]. Certified instructors on the subject of diabetes, who need extra hold and documented experience in clinical practice should be chosen.

V.   CONCLUSION

According to the National Service Framework for Diabetes indicate nurses' knowledge on IEDM could be achieved through continuing education. Health care organizations should construct educational programs related to the training and retraining of non-specialized nursing staff on insulin treatment, children' care and family. There is evidence for the need of educational and counseling intervention on psychosocial support of the child and its family by nurses. Phone counseling in case of emergency is a field where nurses should, also, be educated.

REFERENCES

[1]   E.S. Moghissi, M.T. Korytkowski, M. DiNard, D. Einhorn, R.Hellman, I.B. Hirsch, and G.E. Umpierrez, American Association of Clinical Endocrinologists and American Diabetes Association Consensus Statement on Inpatient Glycemic Control, *Diabetes Care*, *32(6),* 2009, 1119–1131. http://doi.org/10.2337/dc09-9029.

[2]   Institute of Medicine, A summary of the October 2009 forum on the future of nursing: Acute care. Washington, DC: The National Academies Press, 2010, Washington.Retrieved from http://www.nap.edu/catalog.php?record_id=12855.

[3]   S. Down, and F. Kirkland, Injection technique in insulin therapy, *Nursing Times, 108(10),* 2012, 20-21.

[4]   P.L. Wakefield, and M.A. Wilson, Enhancing nurses' knowledge regarding the complex care of hospitalized patients on insulin, *Journal for Nurses in Professional Development*, *30(4),*2014, 174-80

[5]   A.H.A. Al-Ganmi, S.A. Ahmed, and K.B. Abed, Assessment of nurses knowledge concerning type 2 diabetes mellitus management with insulin therapy in intensive care units at Baghdad hospitals,*Kufa Journal for Nursing Sciences, 4(3),* 2014

[6]   R.L. Derr, M.S. Sivanandy, L. Bronich-Hall, and A. Rodriguez, Insulin-related knowledge among health care professionals in internal medicine. *Diabetes Spectrum, 20 (3),* 2007, 177–185

[7]   D.J. Rubin, J. Moshang, and S.A. Jabbour, Diabetes knowledge: Are resident physicians and nurses adequately prepared to manage diabetes? *Endocrine Practice, 13(1),* 2007, 17–21.

[8]   J. Uding, E. Jackson, and A.L. Hart, Efficacy of a teaching intervention on nurses' knowledge regarding diabetes,*Journal for Nurses in Staff Development, 18(6),* 2002, 297–303.

[9]   K.M. El-Deirawi, and N. Zuraikat, Registered nurses' actual and perceived knowledge of diabetes mellitus,*Journal for Nurses in Staff Development, 17(1),*2001, 5–11.

[10]   S.G. Baxley, S.T. Brown, M.E. Pokorny, and M.S. Swanson, Perceived competence and actual level of knowledge of diabetes mellitus among nurses. *Journal of Nursing Staff Development, 13 (2),* 1997, 93–98.

[11]   C. Hessett, A. Moran, and A.J. Boulton, An evaluation of diabetes knowledge amongst general practitioners and senior medical students,*Diabetic Medicine, 6 (4),*1989, 351–353.

[12]   A.S. Shera, F. Jawad, and A. Basit, Diabetes-related knowledge, attitude and practices of family physicians in Pakistan,*The Journal of the Pakistan Medical Association, 52 (10),* 2002, 465–470

[13]   M.D. Page, C. Stephenson, R.M. Pope, and H.J. Bodansky, Prescribing and dispensing of insulin: margin for error? *Diabetic Medicin, 9(10),*1992,938–941.

[14]   www.diabetes.org/.../research-and-practice/we-support-your-doctor/clinical-practice recommendations.html#sthash.4M4meqX7.dpuf D

[15]   American Diabetes Association, Standards of Medical Care in Diabetes, 2015

[16]   M.L. Findlow, and R.S. McDowell, Determining registered nurses knowledge of diabetes mellitus-Nurses Knowledge*, Journal of Diabetes Nursing, 6(6),* 2002, 170-175.

[17]   J.A. Drass J. Muire-Nash , P.C. Boykin, J.M. Turek , and K.L. Baker, Perceived and actual level of knowledge of diabetes mellitus among nurses, *Diabetes Care, 20(5),*1989, 351-356

[18]   C.L. Paul, L. Piterman, J. Shaw, C. Kirby, R.W. Sanson-Fisher, M.L. Carey, J. Robinson, P. McElduff, and I. Thepwongsa, Diabetes in rural towns: effectiveness of continuing education and feedback for healthcare providers in altering diabetes outcomes at a population level: protocol for a cluster randomised controlled trial, *Implementation Science*, 8:30, 2013.

[19]   C. Gordon, M. Walker, and D. Carrick-Sen. Diabetes knowledge in patients' adult offspring,*Nursing Times, 110(26),*2014, 24-6.

[20]   M. Kelo, E. Eriksson, and I. Eriksson. Pilot educational program to enhance empowering patient education of school-age children with diabetes.*Journal of Diabetes & Metabolic Disorders, 12(1)*:16 2013

[21]   A.R.Abduelkarem, and H.J. El-Shareif, Assessment of diabetes-related knowledge among nursing staff in a hospital setting,*Journal of Diabetes Nursing, 17(6),* 2013, 207–218.

[22]   The nutrition care needs of patients newly diagnosed with type 2 diabetes: informing dietetic practice. *Journal of Humam Nutrition Dietetics*, 2016,doi: 10.1111/jhn.12357.

[23]   A. Piaggesi, L. Bini, E. Castro-Lopez, O. Giampietro, E. Schipani, and R. Navalesi, Knowledge on diabetes and performance among health professional in non-diabetological departments.*ActaDiabetoligica, 30 (1),* 1993,25-28

[24]   M.I. Yacoub, W.M. Demeh, M.W. Darawad, J.L. Barr, A.M. Saleh , and M.Y. Saleh. An assessment of diabetes-related knowledge among registered nurses working in hospitals in Jordan.*International Nursing Review,61(2)*, 2014, 255-262

[25]   S.H. Al-Ghabeesh, F. Abu-Moghli, M. Salsali, and M. Saleh, Exploring sources of knowledge utilized in practice among Jordanian registered nurses.*Journal of Evaluation in Clinical Practice, 19(5), 2013,* 889-894