

Effect of Educational Intervention on Knowledge Attitude and Practice of Home Waste Management of Used Insulin Injections Among Diabetics Attending Benha University Hospital, Egypt

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Abstract: This study aim was to change the knowledge, attitude and practice of type 2 diabetics who are on treatment with insulin at home towards household waste management by adequate health education. An interventional study was carried out on patients suffered from type 2 diabetes mellitus who visited the diabetes clinic at Benha University Hospital from April 2014 to March 2016. 500 study subjects were selected through a systematic sampling procedure. It was found that, There was a significant increase in post-educational knowledge, attitude and practice scores% ($p < 0.001$). Sex, age, level of education and occupation were significant predictors for Pre-education knowledge score% while in post-education only occupation was significant predictors. The level of education and occupation were significant predictors for Pre-education attitude score%, while in post-education attitude score%, age and level of education were significant predictors. Sex, age and level of education were significant predictors for Pre-education practice score%, while in the post-education the only level of education was significant predictors and it was concluded that, Knowledge and attitude towards safe insulin injection waste disposal were high; however practice was low pre and post educational stage. Knowledge, attitude and practice of diabetic patients toward safe insulin injection disposal had a strong association with sex, marital status, educational level and type of occupation. A further research to design a low-cost, user friendly program and equipment to suit socio-cultural practices should be done.

Keywords: DM, Sharps Disposal, KAP

1. Introduction

Diabetes is one of the largest global health emergencies of the 21st century. About 415 million adults aged (20-79y) are currently suffering from diabetes all over the world, as 1 in 10 adults have diabetes in 2015. Egypt has the highest number of D.M in adult (7.8 [3.8-9] millions) in Africa [1]. The international diabetes federation (IDF) estimates that there are 34.6 million people with diabetes in the Middle East and North Africa, and this number will be doubled to 67.9 million by 2035, and this will lead to epidemic of diabetes

spread throughout the region if coordinated action is not taken to overcome its risk factors [2].

Diabetes mellitus is a chronic disease whose management may require regular blood tests and insulin injections. Thousands of used sharps and bloodstained materials are generated daily by diabetic patients and require disposal. Sharps discarded in an unsafe manner in the community place people at risk of injury and infection from blood-borne pathogens such as HIV and viral hepatitis [3]. Egypt has the highest prevalence of hepatitis C virus (HCV) in the world, estimated nationally at 14.7% among age group 15-59y

estimated by Egyptian demographic health survey in 2008 [4]. So the problem of unsafe sharps disposal will aggravate the epidemic of HCV.

Type II diabetes is the commonest form of Diabetes all over the world 90% of diabetic population. For better benefits and lesser side effects, physicians prescribe insulin to them in order to control diabetes. Also availability of home blood monitoring devices, different insulin formulas and smaller needles improve patients' acceptance for insulin injections at home [5].

There is no available data on the disposal of syringes, needles and lancets produced by diabetics in their home in Egypt. Mostly, they dispose their used blood stained sharps and syringes in the household waste which may end in municipal garbage. With high prevalence of HBV in Egypt, so this disposal practice may put waste handlers, other household members (e.g. children), cleaning personnel and scavenger boys at risk for exposure to blood borne pathogens. So we aim by this study to change the knowledge, attitude and practice of type 2 diabetics who are on treatment with insulin at home towards household waste management by adequate health education

2. Patients and Methods

An interventional study was carried out on patients suffer from type 2 diabetes mellitus who visited the diabetes clinic at Benha University Hospital from April 2014 to March 2016. An educational program was done by either one of the researchers or the specialized physicians in the diabetes clinic, the patient was educated about safe disposal of sharps (syringes, lancets and needles) into puncture resistant containers, this was done along with other measures to promote health and prevent complications related to diabetes.

2.1. Population and Sampling

A total of 500 study subjects were included in the study through systematic random sampling technique from among 1500 patients that presented at the clinic during the study period. Every third patient who met the inclusion criteria (patients of both sex, above 18 years old and use insulin injection for treatment for any period)

2.2. Data Collection and Management

Data collection was performed through interviewer-administered questionnaires. The content validity of the questionnaire was confirmed by a team of experts including two endocrinologists and a senior nurse. The questionnaire was first written in English and translated to Arabic which is then translated back to English in order to ensure that the translated version gives the proper meaning. The questionnaire was pretested on 50 participants as a pilot study prior to the gross data collection which was not included in our results, and relevant modifications were instituted prior to commencement of actual data collection. Their responses were evaluated by calculating Cronbach

Alpha for the knowledge and attitude sections of questionnaire. The Cronbach alpha value of .74 was obtained for reliability. The final questionnaire consisted of items which were divided into two parts. Part one assesses the socio-demographic and treatment related characteristics of respondents including age, sex, marital status, educational level, occupation and duration of insulin use. Part two includes questions regarding the knowledge and practice towards insulin injection device disposal. Patients' knowledge was assessed using 12 dichotomous (true/false) questions about sharp use, reuse, and sharp waste disposal. The statements had only one "correct" option and the respondents got 1 score for correct answer and 0 score for incorrect answer. The obtained score of knowledge was then classified using mean and standard deviation as "Good Knowledge" (score of 7–12), and "Poor Knowledge" (score of 0–6). To assess attitude, Likert 5 point scale, was used. All the respondents were asked about their opinions to either agree or disagree with the questionnaire statements which correspond to the attitude of respondents on household sharp waste disposal. A total of 12 positive and negative statements were administered to all respondents. For positive statements, the score was given 5 for strongly agree, 4 for agree, 3 for uncertain, 2 for disagree and 1 for strongly disagree response. The reverse score was given for negative statements.

Patients' practices were assessed using 12 questions on using household garbage bags for disposal, frequency of needle reuse, and information seeking of patients regarding insulin injection device disposal, which were answered as either "yes" or "no." A score of 1–8 was considered "Negative Practice" while a score of 9–12 was considered "Positive Practice."

2.3. Statistical Analysis

The final data collection tool was ensured for completeness, and responses were entered into and analyzed by the Statistical Package for the Social Sciences (SPSS) software version 20.0 for Windows. Frequencies and percentages were used to express different variables. One way ANOVA and Student's *t*-test were used to compare groups. Mc-Nemar test was used to compare the same group pre and post intervention. Linear regression and correlation were used to find relationships between variables. All statistical tests were performed using 0.05 as the level of significance.

2.4. Ethical Approval

All procedures performed were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by the ethical committee of Benha Faculty of Medicine. Informed written consent was also obtained from each participant before conducting this study. Participants' information obtained was kept confidential.

3. Results

Table 1 shows that male represents 53.6% while female represents 46.3% of patient with mean age 45.82 ± 8.99 years, majority of the participants were single (59%), house wife (54.4%), their flat was for someone (78.2%), the majority of patients remove wastes by themselves self (83%), the majority of patients had large bin size (85.5%) and large bin

shape with cover (86.7%). Few number of patients were using insulin for 1-5 years (31.2%). All of them using syringes in insulin injection (100%), twice daily dose (73.2%), with 7-14 needle number (66.2%). Glucose test was done with interval more than one month for 64.6% of patients. Most of them were using < 7 needle weekly (93.4%) and had follow up every 3 months (97.2%).

Table 1. Study group regarding socio-demographic and insulin injection data.

	No (500)	%
Sex		
Male	268	53.6
Female	232	46.4
Age Mean \pm SD (range)	45.82 \pm 8.99(18-66)	
Marital status		
Single	295	59.0
Married	82	16.4
Divorced	70	14.0
Widowed	53	10.6
Education		
Illiterate	116	23.2
Read and write	164	32.8
Secondary	160	32.0
University	31	6.2
Post graduate	29	5.8
Occupation		
House wife/	272	54.4
Free work	157	31.4
Governmental work	51	10.2
Students	20	4.0
Flat		
From someone	391	78.2
Individual for you	109	21.8
Waste		
Worker	85	17
Myself	415	83
Bin size (490)		
Small	20	4.1
Medium	51	10.4
Large	419	85.5
Bin shape (490)		
Large with cover	425	86.7
Large without	45	9.2
Small with cover	20	4.1
Insulin use		
<3m	146	29.2
3m-1y	134	26.8
1-5y	156	31.2
>5y	64	12.8
Needle type		
Pen	0	0.0
Syringe	500	100
Doses		
Once	119	23.8
Twice	366	73.2
More	15	3.0
Times		
One/meal	437	87.4
Daily	63	12.6
Needle numbers		
<7	138	27.6
7-14	331	66.2
>14	31	6.2
Glucose test		
Daily	40	8.0
Once/w	90	18.4

	No (500)	%
Once/m	45	9.0
Others	325	64.6
Follow up		
Once/m	14	2.8
Every 3m	486	97.2

Table 2 illustrates that regarding knowledge score% there was an increased in the mean knowledge score from 57.2 ± 27.8 pre-intervention to 85.2 ± 16.2 after the intervention and the good knowledge score% increased from 65.2% to 85.4%, Regarding Attitude score%, the mean Attitude score% in pre-education was 27.17 ± 12.79 and in the post-education was 46.75 ± 14.55 , positive Attitude score% changed from 11.4% to 58.4%, and Regarding Practice score%, the mean practice score% in pre-education was 39.9 ± 2.9 and in the post-education was 42.8 ± 5.6 , Good practice score% changed from 3% to 18% and the difference between pre-education and post-education in knowledge ($p < 0.001$), attitude ($p < 0.001$) and practice score ($p < 0.001$) was statistically significant.

Table 2. Comparison of Knowledge, Attitude and Practice scores% pre and post educational program.

	Pre education (500)	Post education (500)	P value
Knowledge score%			
Poor knowledge (<50%)	174(34.8)	73(14.6)	<0.001*
Good knowledge ($\geq 50\%$)	326(65.2)	427(85.4)	
Mean \pm SD (range)	57.08 ± 27.84 (8.33-100)	65.25 ± 16.84 (25-91.67)	<0.001*
Attitude score%			
Negative (<50%)	443(88.6)	208(41.6)	<0.001*
Positive ($\geq 50\%$)	57(11.4)	292(58.4)	
Mean \pm SD (range)	27.17 ± 12.79 (0-58.3)	46.75 ± 14.55 (16.67-75)	<0.001*
Practice score%			
poor(<50%)	485(97.0)	410(82.0)	<0.001*
Good ($\geq 50\%$)	15(3.0)	90(18.0)	
Mean \pm SD (range)	39.92 ± 3.98 (33.3-50)	42.83 ± 5.56 (33.3-58.3)	<0.001*

*= significant

Table 3 reveals that, The difference between the male and female groups was significant in pre educational knowledge, attitude and practice scores%, and in post educational attitude and practice scores% while there was non-significant statistical difference between them in post educational knowledge score%.

Table 3. Comparison of Knowledge, Attitude and Practice scores% pre and post educational program regarding socio-demographic data.

	Knowledge Mean% \pm SD		Attitude Mean% \pm SD		Practice Mean% \pm SD	
	Pre education	Post education	Pre education	Post education	Pre education	Post education
Sex						
Male	54.38 ± 29.32	64.37 ± 17.06	24.69 ± 12.36	45.01 ± 15.55	40.27 ± 3.87	43.53 ± 5.95
Female	60.20 ± 25.47	66.27 ± 16.40	30.03 ± 12.59	48.77 ± 12.90	39.51 ± 4.05	42.03 ± 4.90
P value	0.019*	0.208	<0.001*	0.004*	0.033*	0.002*
Age r(p value)	-0.291(0.001*)	-0.125(0.005*)	-0.056(0.212)	0.212(0.001*)	-0.117(0.009*)	-0.021(0.637)
Marital status						
Single	55.40 ± 26.50	64.35 ± 17.04	26.55 ± 13.70	45.06 ± 15.54	40.25 ± 4.65	43.52 ± 5.94
Married	61.59 ± 23.45	66.04 ± 16.33	33.94 ± 8.15	49.79 ± 11.44	39.63 ± 3.60	41.67 ± 4.94
Divorced	63.33 ± 14.83	78.57 ± 18.96	23.21 ± 6.48	41.67 ± 20.83	41.07 ± 2.16	45.0 ± 4.17
Widowed	31.13 ± 26.76	91.67 ± 0.0	25.31 ± 15.41	41.67 ± 0.0	40.09 ± 3.29	41.67 ± 0.0
P value	<0.001*	0.003*	<0.001*	0.001*	0.191	0.001*
Education						
Illiterate	38.71 ± 25.78	64.69 ± 15.92	18.53 ± 9.20	46.61 ± 16.05	40.52 ± 2.89	42.86 ± 4.32
Read and write	47.13 ± 32.93	65.63 ± 20.21	27.29 ± 10.17	46.88 ± 13.87	38.72 ± 4.1	41.67 ± 0.0
Secondary	62.96 ± 20.21	67.86 ± 18.73	27.86 ± 11.75	47.02 ± 6.81	40.99 ± 4.28	41.67 ± 0.0
University	57.03 ± 27.73	64.58 ± 10.96	33.60 ± 12.82	55.21 ± 4.09	40.86 ± 4.98	42.23 ± 5.51
Post graduate	63.89 ± 16.27	83.62 ± 8.48 0.696	25.0 ± 0.0	50.29 ± 8.48	43.10 ± 3.20	45.83 ± 7.26
P value	<0.001*		<0.001*	<0.001*	<0.001*	<0.001*
Occupation						
House wife/retired	55.45 ± 29.23	63.41 ± 20.01	22.06 ± 8.97	37.5 ± 9.48	40.26 ± 3.86	44.93 ± 5.91
Free work	59.24 ± 26.55	62.63 ± 13.67	30.36 ± 13.21	51.52 ± 10.38	39.60 ± 4.18	39.89 ± 3.42
Governmental work	65.20 ± 23.85	70.83 ± 15.07	39.71 ± 14.0	49.74 ± 13.46	38.40 ± 4.11	43.23 ± 4.40
Students	41.67 ± 14.81	55.56 ± 23.81	39.58 ± 11.11	42.75 ± 17.85	41.67 ± 0.0	41.67 ± 4.89
P value	0.006*	<0.001*	<0.001*	<0.001*	0.002*	<0.001*

*Significant

Also it shows that there was significant negative correlation between age and pre and post education knowledge score%, significant positive correlation between age and post education attitude score% and significant negative correlation between age and pre education knowledge score%.

Also it reveals that there was statistically significant difference between different marital status in pre and post education in knowledge, attitude and practice scores%.

Regarding educational level there was statistically significant difference between different educational levels in pre and post education in knowledge, attitude and practice

scores% except in post educational knowledge score%, there was non-significant statistical difference ($p=0.696$).

Also shows that there was statistically significant difference between different occupations in pre and post education in knowledge, attitude and practice scores ($P=0.006$, <0.001 , <0.001 , <0.001 , 0.002 & <0.001 respectively).

Table 4 states that sex, age, level of education and occupation were significant predictors for Pre-education knowledge score%, while in post-education only occupation was significant predictors in post-education knowledge score%.

Table 4. Regression analysis for predictors of knowledge, attitude and practice score% pre and post education.

	Knowledge		Attitude		Practice	
	Pre education B (P)	Post education B(P)	Pre education B(P)	Post education B(P)	Pre education B(P)	Post education B(P)
Sex (ref=female)	-0.95 (0.009)*	-0.279(0.593)	-2.02(0.061)	0.985(0.475)	-7.36(0.008)*	0.821(0.23)
Age	-0.197(<0.001)*	-0.052(0.066)	0.12(0.051)	0.300(<0.001)*	-0.409(0.01)*	0.12(0.21)
Education	-0.935(<0.001)*	-0.144(0.495)	5.26(<0.001)*	0.398(0.477)	2.81(0.021)*	3.62(0.003)*
Occupation (ref= non-working)	-1.624(<0.001)*	-4.401(<0.001)*	5.45(<0.001)*	9.12(<0.001)*	-0.063(0.982)	0.12 (0.055)
F (p)	30.67(<0.001)*	19.81(<0.001)*	57.55(<0.001)*	16.86(<0.001)*	5.99(<0.001)*	7.21(<0.001)*
R ² (R ²)	0.199(0.192)	0.138(0.131)	0.317(0.312)	0.120(0.113)	0.046(0.038)*	0.21(0.198)

*Significant

It also illustrates that level of education and occupation were significant predictors for Pre-education attitude score%, while in post-education attitude score%, age and level of education was significant predictors.

Also sex, age and level of education were significant predictors for Pre-education practice score%, while in post-education only level of education was significant predictors in post-education practice score%.

4. Discussion

Diabetes mellitus (DM) is a chronic disease. Patient with DM needs to have adequate knowledge and attitude and good practice for self-care activities including adequate sharps disposal at home. The present study aimed to determine the level of knowledge, attitude and practice towards household waste management among type 2 diabetic patients who are treated with insulin at home pre and post educational course.

The present study shows that female represents nearly half of the studied group 46.4% of patient with mean age 45.82 ± 8.99 years. This coincide with studies conducted in Egypt as nearly half of both participants were female with mean age $46.72 \pm 7.84^{5,6}$. This agrees with Dierein et al, who found that middle and late adulthood populations consist the majority of diabetic patients in Egypt and Africa [7].

More than half of patients were single (59%), house wives (54.4%). The majority of patients remove wastes by themselves (83%), few number of patients were using insulin for 1-5 years (31.2%). All our study group patients are using syringes in insulin injection, this in agreement in study conducted in Pakistan 88.3% of patient using syringes in insulin injection [8].

In the present study we found that more than 50% of the

patients have good knowledge score% pre education about sharp use, reuse, and sharp waste disposal this increased after education to 85.4%. Our study reported higher values than the study conducted in Delhi, India [5], where only 23% had high level of knowledge and higher than the study conducted in Ethiopia, as only 21% only of the respondents had high knowledge score [9, 10]. Education played an important role in increasing positive attitude score% and good practice score from 11.4% & 3% pre-education to 58.4% & 18% post education respectively. This findings were in agreement with studies done in in India and USA showing that education received from healthcare providers played a very important role, as shown by significant correlation [5,11].

The current study revealed that 82% of respondents had poor practice score after education on insulin device disposal. This finding was much higher compared to other studies (31.0%) [5]. The majority of patients dispose injections sharps into the household garbage by themselves (83%) in the street. As they did not have any sharps container. However, the UK Diabetes Guidelines recommended the use of opaque hard plastic containers for disposing sharp waste [12]. This may be higher than a study conducted in Stafford, where 35.1% of patients disposed their lancets and syringes into household garbage bin [13] and another study done in Virginian and France where 50% and 49.9% of patients disposed their lancets [14, 15].

This might be due to many reasons: low social media coverage in health sector related to sharps disposal, lack or absence of public health education and absence of safe disposing system, and poor the government commitment to proper waste disposal.

Regarding influencing factors, females had higher mean attitude score% (30.03 ± 12.59 - 48.77 ± 12.90) than males pre

and post education respectively. Both of them had good knowledge score% but females showed higher mean than males (60.20 ± 25.47 - 66.27 ± 16.40) pre and post education respectively. Age is negatively correlated with knowledge; attitude and practice mean score% pre and post education. there was statistically significant difference between different educational levels in pre and post education in attitude and practice scores%.

Our study revealed that the educational program had a great influence on patients of different educational levels regarding their attitude, knowledge and practice of safe needles and insulin injection device disposal. Patients who join university or post graduates studies had significantly higher overall mean score of knowledge, attitude and practice than those who were illiterate. This may be due to having a better chance to get information from courses and social media than those who are illiterate. This result coincide with study conducted in Ethiopia¹⁰ and differ from study conducted in south Africa, where there is no significant association between educational level and accurate sharp disposal of insulin injection wastes [16].

5. Conclusions

The study revealed that Knowledge and attitude towards safe insulin injection waste disposal were high; however practice was low pre and post educational stage. The study revealed that knowledge, attitude and practice of diabetic patients toward safe insulin injection disposing had strong association with sex, marital status, educational level and type of occupation. Higher knowledge and practice were observed among young age patients. A further research to design a low-cost, user friendly program and equipment to suit socio-cultural practices should be done.

Competing Interests

The authors declare that they have no conflict of interest.

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