Original article

Knowledge, attitude, and practice on insulin administration among diabetic patients and their caregivers – Cross-sectional study

Anu Sunny [a], Uday Venkat Mateti [a,*], Adithi Kellarai [b], Shraddha Shetty [c], Shaikh Rafiya Rafikahmed [a], Shivaprasad Sirimalla [a], Anjana Madhusoodanan [a]

[a] Nitte (Deemed to be University), NGSM Institute of Pharmaceutical Sciences, Department of Pharmacy Practice, Deralakatte, Mangaluru, Karnataka, India
[b] Nitte (Deemed to be University), KS Hegde Medical Academy, Justice KS Hegde Charitable Hospital, Department of General Medicine, Deralakatte, Mangaluru, Karnataka, India
[c] Nitte (Deemed to be University), KS Hegde Medical Academy, Department of Biostatistics, Deralakatte, Mangaluru, Karnataka, India

ABSTRACT

Introduction: Insulin therapy is the cornerstone treatment of diabetic patients. Most diabetic patients cannot self-administrate insulin due to various reasons to depend on caregivers.

Objectives: To assess the knowledge, attitude, and practice (KAP) on insulin administration among diabetic patients and their caregivers.

Methods: A prospective cross-sectional study was conducted for seven months. All diabetic patients age above 18 years who were on insulin therapy for more than six months were included in the study. Patient medical records were used to collect demographic information such as age, gender, educational status, occupation, socioeconomic class, HbA1c, and insulin duration. The validated KAP questionnaire was used for the assessment of KAP among patients or caregivers.

Results: A total of 255 patients were included, out of which 163 (63.92%) were male and 92 (36.07%) were female. The mean KAP score was 65.05 ± 14. There is no significant correlation between the HbA1c levels with KAP scores among diabetic patients. There is a significant link between the knowledge, attitude, and Overall KAP patients with education qualification ($p < 0.05$), occupation ($p < 0.05$), economic class of the patients ($p < 0.05$), and duration of insulin treatment ($p < 0.05$).

Conclusion: The patients average age was 55.74 years. The results showed that the mean KAP score was 65.05, which is less and most of the patients had not controlled their glycemic levels. Effective education regarding insulin administration and glycemic control improves the KAP among patients or caregivers.

1. Introduction

According to the International Diabetes Federation (IDF), more than 80% of diabetes patients reside in low- and middle-income nations.[1] Diabetes is estimated to affect 463 million people in 2019, with this figure expected to rise to 578 million by 2030 and 700 million by 2045.[2] Type 2 diabetes mellitus (DM) is most common after middle age, affecting both sexes equally and most commonly occurring between the ages of 50 and 70. Type 1 DM is most commonly occurs at 10–12 years with slight male supremacy. However, in some cases, elderly people can have Type 1 DM, and children can have type 2 DM.[3] Insulin is a powerful and necessary drug for controlling blood sugar levels. The chief advocated for treatment in patients with Type 1 diabetes, and it is frequently

used as an adjuvant to oral hypoglycemic agents in patients with Type 2 diabetes who have not met their target blood glucose level. The main goal of diabetes management is to keep blood sugar levels within normal ranges. In order to meet this criterion.[4] Insulin is available in its speed of action like rapid, short, intermediate, and long-acting types. Insulin administration is performed on different body sites, in which the abdomen is the most common site for injection.[5]

Self-administration of insulin depends on the knowledge and attitude of the patient on insulin therapy. Various studies have been carried out worldwide regarding the knowledge attitude and practice (KAP) of patients on self-administration of insulin. The studies reported that the KAP might vary depending on age, gender, marital status, educational background, employment, urban residence, duration of disease, etc.[6,7,8]

Knowledge about the administration of insulin is essential in diabetic patients. Various Indian studies have been emphasized diabetic epidemiology, but studies related KAP survey in diabetes are limited.[9,10,11] Previously conducted studies have not assessed the correlation between KAP scores and glycemic control. Most diabetic patients cannot self-administrate insulin for various reasons (elderly patients, multiple diseases, presence of psychological problems and cognitive impairment, the complexity of treatment, etc.), so they may depend on caregivers. Hence the present study aims to conduct the KAP on insulin administration among DM patients or their caregivers and assess the correlation between KAP scores and glycemic control.

2. Methods

2.1. Study design, setting, and participants

A prospective cross-sectional study design was conducted in the general medicine unit of a tertiary care teaching hospital. The current study is a 7-month hospital-based study. The sample size was calculated at the beginning of the study (n = 255) was arrived at by considering previous records of patients on insulin therapy visiting the hospital in the preceding years.

2.2. Ethical permission and registry

Before starting the KAP survey, permission was obtained from the Institutional Ethics Committee of NGSM Institute of Pharmaceutical Sciences, Mangaluru (Ref. No: NGSMIPS/IEC/04/2020) and the study registered under the Clinical Trials Registry of India (Ref. No: CTRI/2020/12/029782).

2.3. Study criteria

All the diabetic patients of age above 18 years and either gender on insulin therapy for more than six months and patients willing to answer KAP questions (self-administration or administration by caregivers) were included. Patients who cannot give informed consent, patients with mental illness, pregnant women, and critically ill patients were not included in the study.

2.4. Development of knowledge, attitude and practices (KAP) questionnaire

The KAP questionnaire was developed by referring to primary, secondary and tertiary resources. Primary resources include various articles[9,12,13] related to administration of insulin. Secondary resources include databases such as UpToDate, Medscape and WebMD.[14,15,16] Tertiary resources include the pharmacotherapy textbook.[17] The KAP questionnaire consists of 15 questions based on knowledge (n = 5), attitude (n = 5) and practice (n = 5) of insulin administration (The KAP questionnaire is attached as Supplementary data).

2.5. Validation and translation of KAP questionnaire

The KAP questionnaire was validated by an expert committee of doctors (n = 3), academic pharmacist (n = 2), nurse (n = 1). Necessary changes were made in the questionnaire as per the expert guidance. The validated KAP questionnaire was translated into Kannada and Malayalam using a three-step method that included forward translation, reverse translation, and patient testing.

2.6. Reliability of KAP questionnaire

Two interviews were done seven days apart in the same patients to test the reliability of the KAP questionnaire. The cronbach's alpha value ≥ 0.70 was considered as reliable. The reliability test was conducted on 40 patients, 20 of whom spoke Kannada, and 20 spoke Malayalam.

2.7. Data collection

Patients who met the inclusion criteria were assessed for the KAP of insulin administration. The details such as age, gender, educational status, occupation, HbA1c, duration of insulin treatment, socioeconomic class[18] were collected from patient medical records. Glycemic control was assessed based on HbA1c levels. It was considered as controlled blood sugar, if the HbA1c level is <7%, and not controlled, if the HbA1c level >7%.[19]

2.8. Assessment of outcome

The KAP was evaluated using the following formula:

$$\text{KAP Score Evaluation} = \frac{\text{Total number of correct respones answered}}{\text{Total number of actual correct responses}} * 100$$

2.9. Statistical analysis

The difference in KAP of self-administered patients and caregivers, glycemic control and KAP score; gender, and domiciliary status was assessed by an independent sample *t*-test. The difference in KAP scores and education qualification, occupation, economic class of the patients, and duration of insulin treatment was assessed by the ANOVA test. Pearson Correlation evaluated the correlation between the HbA1C levels with KAP score. The p-value <0.05 was conceded as statistically significant. The statistical analysis were performed using SPSS software version 20.0.

3. Results

3.1. Demographic characteristics

In this study, a total of 255 patient data was collected. Out of 255, 64.70% of patients (n = 165) self-administered their insulin injection and 35.29% of them by caregivers (n = 90). The average age of the overall patients was 55.74 ± 12.97 years. The most of the patients (63.92%) were men, followed by women (36.07%), and 38.03% had completed middle school. Of the total population considered 57.25% were unemployed, 82.35% were living in the rural area, and 64.70% of patients came under the socioeconomic class of upper-lower as described in Table 1. The median duration of diabetes for overall patients was 6 (11-3) years, and the median duration of insulin treatment for overall patients was 1 (3-0.70) years.

3.2. Reliability of KAP questionnaire

The reliability test was on 40 patients, among which 20 were Kannada and 20 were Malayalam patients, and the results found that the KAP questionnaire is reliable with the cronbach's alpha value > 0.70. The details are described in Table 2.

3.3. Assessment of KAP among self-administered patients and caregivers

The mean KAP scores among self-administered patients and caregivers were 65.05± and 64.52±, respectively (p = 0.571). There is no measurable difference in KAP scores between diabetic patients and their care givers. The detailed KAP scores are presented in Table 3.

3.4. Assessment of glycemic control among DM patients

Out of 255 patients, 7.45% of patients (n = 19) had glycemic control with mean HbA1C levels of 6.25% ± 0.47% and 92.54% patients (n=236) had not controlled glycemic levels with a mean HbA1C levels of

Table 1
Demographic details of patients.

Demographic characteristics	Frequency (n = 255) (%)
Age groups	
18–30	11(4.31%)
31–45	40(15.68%)
45–60	110(43.13%)
More than 60	94(36.86%)
Gender	
Male	163(63.92%)
Female	92(36.07%)
Education qualification	
Illiterate	13(5.09%)
Primary school	93(36.47%)
Middle school	97(38.03%)
High school	17(6.66%)
Post high school	5(1.96%)
Graduate or postgraduate	24(9.41%)
Professional degree	6(2.35%)
Occupation	
Unemployed	146(57.25%)
Unskilled worker	35(13.72%)
Semiskilled worker	2(0.78%)
Skilled worker	18(7.05%)
Clerical, shop owner/farm	39(15.29%)
Semi professional	2(0.78%)
Professional	13(5.09%)
Socio-economic class	
Upper	1(0.39%)
Upper middle	25(9.80%)
Lower middle	27(10.58%)
Upper lower	165(64.70%)
Lower	37(14.50%)
Domiciliary status	
Rural	210(82.35%)
Urban	45(17.64%)
Duration of insulin (In years)	
<2	156(61.17%)
2–5	61(23.92%)
6–10	28(10.98%)
>10	10(3.92%)

Table 2
Reliability of Kannada and Malayalam language KAP questionnaire.

Domains	Day 1 Test Score (Mean ± SD)	Day 7 Test Score (Mean ± SD)	Cronbach's alpha value
Reliability of Kannada language KAP questionnaire			
Knowledge	59 ± 16.51	61 ± 16.51	0.964
Attitude	72 ± 19.89	73 ± 18.66	0.986
Practice	68 ± 16.41	68 ± 16.41	1
KAP	66.33 ± 11.74	67.33 ± 10.57	0.988
Reliability of Malayalam language KAP questionnaire			
Knowledge	57 ± 13.41	58 ± 14.36	0.973
Attitude	73 ± 20.79	74 ± 2.62	0.988
Practice	65 ± 15.72	66 ± 17.29	0.981
KAP	64.99 ± 12.21	65.99 ± 12.95	0.990

8.97% + 1.74%. Out of 19 glycemic control patients, 10 patients (6.06%) were self-administered, and 9 patients (10%) were caregivers administered patients. The detailed glycemic control among DM patients is presented in Table 3.

3.5. Factors affecting KAP of diabetic patients

There is a significant association between the Knowledge, Attitude, and Overall KAP patients with education qualification (p < 0.05), occupation (p < 0.05), economic class of the patients (p < 0.05), and duration of insulin treatment (p < 0.05). The details are presented in Table 4.

Table 3
Assessment of KAP and glycemic control.

Assessment	Self-administered Patients (n = 165)	Caregivers (n = 90)	p-value
Knowledge Score	57.69 ± 18.26	60.66 ± 17.59	0.249
Attitude Score	75.15 ± 18.76	72.22 ± 20.70	0.150
Practice Score	62.78 ± 16.51	62.66 ± 18.77	0.50
KAP Score	65.05 ± 14.62	64.52 ± 15.77	0.571
Assessment of glycemic control among diabetic patients			
Assessment	**Glycemic Controlled Patients (n = 19)**	**No Glycemic Controlled Patients (n = 236)**	p-value
Knowledge Score	60 ± 16.32	58.64 ± 18.21	0.590
Attitude Score	73.68 ± 17.70	74.15 ± 19.64	0.335
Practice Score	61.05 ± 20.51	62.88 ± 17.06	0.610
KAP Score	64.90 ± 11.93	64.85 ± 15.24	0.111

4. Discussion

Insulin therapy necessitates the understanding and cooperation of both the patient and caregiver. Diabetes patient's condition can worsen due to improper insulin administration. Therefore, it is necessary to assess the patients or caregiver's KAP on insulin administration. In this study, the average age of the study population was 55.74 ± 12.97 years. The results were consistent with the similar studies conducted by Chawla SP et al., and Solanki JD et al., where the mean age was 55.50 ± 9.37 [20] and 56.64 ± 13.21 years[13] respectively.

The study noticed that 163(63.92%) male patients outnumbered female patients 92(36.07%). Similar findings were found in the studies conducted by Shrestha D et al., *and* Dinesh PV et al., where the majority of the patients were male 58%,[12] 61.25% [21], respectively. In the present study, most patients (38.03%) were having a middle school education. The study results were in contrast with similar studies conducted by Dinesh PV et al., where most patients have upper primary schooling.[21] The study conducted by Netere AK et al., showed that most of the patients (31.3%) had primary and secondary education.[4] In the present study, the majority of the patients were unemployed. A study conducted by Berhe KK et al., showed that most patients (34.3%) were unemployed.[2] However, according to a study done by Dinesh PV et al., reported that most of the patients (28.5%) were agriculturists and self-employed.[21]

The median duration of insulin treatment for overall patients was 1 (3-0.60) years. This result was in contrast with the study conducted by Netere AK et al., where the mean duration of insulin 2.3 ± 0.8 years.[4] The present study found that most patients lived in rural areas (82.35%), and the rest of the patients lived in urban areas (17.64%). Similar findings were found in the studies conducted by Netere et al., and Mariye T et al., where most patients lived in rural areas (51.8%[7] and 59%,[22] respectively).

In the current study, the KAP questionnaire is reliable with Cronbach's alpha value > 0.7 Similar findings were found in the studies conducted by Amiri P et al., and Werfalli MM et al., where the KAP questionnaire was reliable with cronbach's alpha value > 0.7 [23,24] The mean scores for knowledge, attitude, practice, and total KAP score were 57.69 ± 18.26, 75.15 ± 18.76, 62.78 ± 16.51, and 65.05 ± 14.62, respectively. Contradicted to the Surendranath et al., findings found that the mean scores for knowledge and practice were 46.9 ± 3.98 and 46.8 ± 2.18, respectively.[3] Binhemd TA, conducted a study that showed that the mean KAP score was 84 ± 11.6.[25]

Our study shows a significant association between the KAP of patients with education qualification, occupation, economic class of patients, and duration of insulin treatment. This result was in contradiction to the study conducted by Solanki JD et al., where there was a significant association between age and educational level with KAP.[13] In our study,

Table 4
Education qualification and occupation vs. KAP assessment.

Education qualification		Knowledge		Attitude		Practice		KAP	
		Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value
Illiterate		53 ± 12	0.000	60 ± 20	0.000	60 ± 0	0.118	57.77 ± 10.18	0.000
Primary school		52 ± 14		69 ± 16		60 ± 17		59.07 ± 14.53	
Middle school		55 ± 16		74 ± 18		62 ± 16		64.13 ± 12.62	
High school		62 ± 23		83 ± 14		67 ± 13		70.55 ± 14.34	
Post high school		60 ± 16		85 ± 19		55 ± 25		66.66 ± 5.44	
Graduate or postgraduate		72 ± 19		83 ± 23		72 ± 15		75.66 ± 14.55	
Professional degree		88 ± 18		100 ± 0		68 ± 18		85.33 ± 8.69	
Occupation									
Unemployed		56 ± 17	0.001	76 ± 19		630 ± 17	0.002	65.07 ± 14.14	0.001
Unskilled worker		52 ± 14		66 ± 18		60 ± 16		60 ± 12.83	
Semiskilled worker		80 ± 0		60 ± 0		60 ± 0		66.66 ± 0	
Skilled worker		55 ± 17		78 ± 17		60 ± 16		61.21 ± 18.78	
Clerical, shop owner/farm, work shop		57 ± 16		73 ± 18		62 ± 16		64.24 ± 11.53	
Semi professional		70 ± 32		90 ± 14		80 ± 0		80 ± 18.86	
Professional		78 ± 22		93 ± 13		73 ± 18		81.66 ± 12.10	
Duration of Insulin Treatment (Years)									
<2		53 ± 18	0.000	71 ± 19	0.007	61 ± 17	0.086	61.61 ± 15.42	0.000
2–5		67 ± 16		82 ± 18		67 ± 15		71.92 ± 10.64	
6–10		64 ± 16		82 ± 15		63 ± 14		70 ± 9.50	
>10		67 ± 16		83 ± 20		73 ± 10		74.44 ± 11.48	
Socio-economic class									
Upper	80 ± 0	0.034		100 ± 0	0.006	80 ± 0	0.121	86.66 ± 0	0.003
Upper middle	68 ± 23			86 ± 19		70 ± 16		74.78 ± 12.71	
Lower middle	58 ± 18			79 ± 15		63 ± 19		66.66 ± 12.80	
Upper lower	56 ± 17			73 ± 19		61 ± 16		62.97 ± 14.83	
Lower	55 ± 9			67 ± 16		60 ± 13		60.60 ± 10.09	

there is no significant correlation between the HbA1C levels with KAP scores. These results were in contrast with the study conducted by Solanki JD et al., where there was a positive correlation between the KAP score and glycemic control (HbA1C). [13]The study conducted by Binhemd TA, reported a positive correlation between HbA1C and knowledge and a negative correlation with attitude and practice.[25]

5. Limitations

As the current study was conducted at a single center, the findings may not be extrapolated to the general population. The findings may not be generalized to a larger population since the study was conducted for seven months as it gives fewer data. Since it is a cross-sectional study, the findings cannot be generalized for a period of time.

6. Conclusion

In the present study, male patients surpassed the female patients. The mean age of the patients was 55.74 years. The results showed that the mean KAP score was 65.05. There is a significant association between the knowledge, attitude, and overall KAP patients with education qualifications, occupation, economic class of the patients, and duration of insulin treatment. There is no significant correlation between the HbA1C levels with KAP score among diabetic patients, and most patients had not controlled their glycemic levels. Effective education regarding insulin administration and glycemic control improves the KAP among patients or caregivers.

Declaration of competing interest

The authors state that they have no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cegh.2021.100860.

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