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Research Article

Knowledge, Attitudes and Perceptions of Patients towards Insulin Therapy at Primary Care Centers in Trinidad

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Introduction

Occupying just over 5,128 square kilometers, Trinidad has an overwhelming prevalence of type II Diabetes Mellitus (DM), with a self reported prevalence as high as 20% in some adult populations [1]. The resultant economic burden as well as morbidity and mortality associated with DM have also been documented [2,3].

Studies in Trinidad have highlighted shortfalls at the primary care level, in the management of DM, as many persons living with diabetes (DPs) are not meeting recommended best practice guidelines [4,5].

Diabetes is a progressive disease that is initially managed with lifestyle change, metformin and oral hypoglycemic therapies. Insulin treatment is the major definitive effective treatment for those who remain uncontrolled on oral treatments. Insulin has been available free of charge to Trinidad nationals since 2003 under the CDAP (Chronic Disease Assistance Programme). Despite this, however, only 44-56% of our DPs in primary care have an acceptable HbA1c (<7%) [5,6].

Studies have highlighted that there is inertia on the part of both patient and physician with respect to starting insulin therapy with such delays resulting in complications [7,8]. Several reasons for this have been described in the literature. Physician reluctance to prescribe glucose lowering medications, patients' "psychological insulin resistance", physicians' lack of knowledge of patients' fears about insulin, doctors and patients' lack of knowledge about diabetes and insulin, system barriers (inadequate time, lack of continuity of care), fear of needles, fear of weight gain, hypoglycemia, social stigma,

anxiety related to insulin administration, and availability of insulin pens have been cited as some of the contributing factors [9-20].

Methods

This study was a cross-sectional survey of patients in the public health system of Trinidad. The public primary care system is administered by the Regional Health Authorities (RHAs) of which there are 4 in Trinidad. (PCPs) All of the DPs who attended the chronic disease clinics at their local health centre formed the study population of patients. A target of 400 patients across all 4 RHAs was chosen (using an estimated sample proportion of 50%, power of 80%, alpha of 5% the sample size was 383). Within each RHA at least 4 health centers were randomly selected using a table of random numbers. At each health centre, convenience sampling of 30 DPs was done based on selecting consecutive patients who attended the chronic disease clinic for their usual appointment. All included patients were adults (>18 years) with a history of type II diabetes. Patients with blindness, deafness and disabilities of the upper limbs that may hinder administration of insulin therapy and pregnancy were excluded.

In the absence of a standardized inventory looking at knowledge, attitudes and perceptions towards insulin therapy a de novo questionnaire (See Appendix I) was designed and pilot tested before face-to-face interviews were conducted. SPSS version 17 was used to analyze the data obtained using 95% confidence intervals and significance levels of 5%. Chi squared tests were used to compare independent groups of categorical variables. Means were compared with t tests or non-parametric equivalents where appropriate. Multivariate logistic regression was used to determine predictors of responses based on age, education status, gender, economic status, medication type and HbA1c. Permission to conduct this survey was obtained from the Ethics Committee of the University of the West Indies, Faculty Medical Sciences and the relevant RHAs. Written consent was obtained from all patients before questionnaire administration.

Results

Patient survey

A total of 405 patients were interviewed in this study with 262 (64.7%) females and 143 (35.3%) males. In total, 418 patients were approached and 13 patients declined to participate, which demonstrated a response rate of 97%. The majority of patients were of East Indian descent 232 (57.3%) and Africans represented the second highest ethnicity with 113 (28%) patients. The mean age of the patients interviewed was 60.6 years (SD = 11.4, range = 23-92). The education levels of the patients were primary level, secondary level, tertiary level, advanced degree and professional certification in 61.7%, 30.5%, 4.7%, 0.7% and 2% respectively.

The study sample comprised of patients from all four Regional Health Authorities (RHAs) on the island of Trinidad of which 75 (18.5%) were from RHA1, 108 (26.7%) from RHA2, 120 (29.6%) from RHA3, and 102 (25.2%) from RHA4.

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Of the 405 patients, 275 (67.9%) were non-insulin users whereas 130 (32.1%) were insulin users. The mean duration of diabetes was 11.1 years (SD = 9.6). A recent HbA1c result (within the past 6 months) was available for 198 (48.9%) of the sample. Furthermore, 392 (96.8%) did not know their last HbA1c value. Education level, age, RHA and ethnicity were not predictive of knowledge of last HbA1c value.

The mean HbA1c was 7.65% (SD = 2.33%). Overall 50% of participants had HbA1c values greater than 7%. As shown in Figure 1, the HbA1c value was significantly higher among Insulin users (Mean 8.9, Median 8.85%) compared to non-users (Mean 7.15%, Median 6.8%, $P < 0.001$ (Mann Whitney U)). Similarly more insulin users (69.6%) compared to non-users (42.3%) had uncontrolled diabetes (HbA1c>7%, $P = 0.001$). Education, ethnicity and RHA were not predictive of glycemic control. In a subgroup of patients with an HbA1c > 10%, 42% (14/33) were not on insulin.

Figure 1: Comparison of Hba1c values between insulin users and non-users.
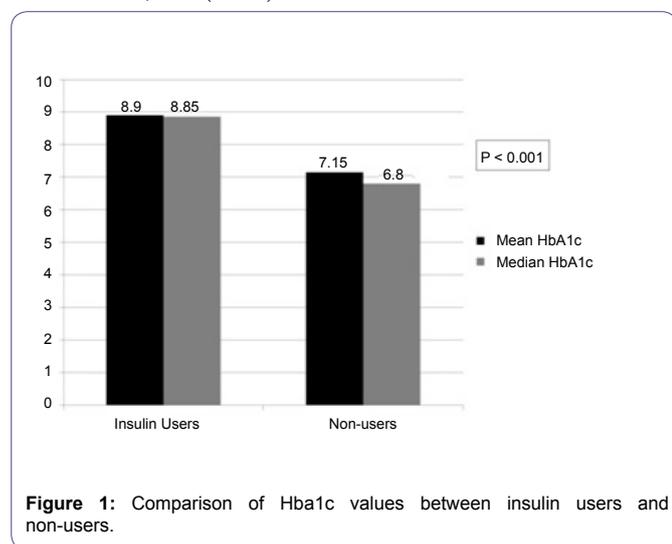
Insulin users: Of the 130 insulin users, 127 (97.7%) used the syringe, 3 (2.3%) used the pen device to administer the insulin and none had access to insulin pumps. Sixty two persons (47.7%) thought that usage of the pen device would be easier, while 6 (4.6%) did not agree and the remainder 62 (47.7%) did not know. Insulin users had been using insulin for an average of 5.7 years and the number of injections they injected per day ranged from a 1-5 with a daily average of 1.8. When asked if taking more injections would trouble them, 47.7% of them said yes whereas 52.3% of them said no. 81.5% of the insulin users self-administered, while 18.5% had a family member administer it for them.

Of the insulin users, 91 (70%) thought that the injections were easy to take, whereas 39 (30%) felt that the injections were not easy to take. When asked about payment options for their insulin, 124 (95.4%) of the patients on insulin therapy said that it was always free. When asked if they found insulin administration convenient, 105 (80.8%) of the insulin users found it to be convenient and 25 (19.2%) did not. Of the insulin users, 45 (34.6%) felt self-conscious about taking injections in a public place whilst 85 (65.4%) did not.

Users were asked about perceived barriers towards continuing insulin therapy. Table 1 summarizes these barriers and responses. The patients were also asked if the insulin administration was ever painful. Sixty seven (51.9%) said that it was sometimes painful, 51 (39.5%) said that it was never painful, 6 (4.7%) said it was painful most times and 5 (3.9%) said that it was always painful. When asked if insulin

therapy interfered with their everyday activities, 103 (79.2%) of the insulin users said not at all, 24 (18.5%) said a little and only 3 (2.3%) said a lot. One hundred and thirteen (86.9%) of the insulin users followed the insulin regime recommended by their doctors while 17 (13.1%) of them did not.

Barriers to Continuing Insulin Therapy	Insulin user's Response		
	Yes	**No**	**Don't Know**
Ease of Administration	91 (70%)	39 (30%)	n/a
Convenience	105 (80.8%)	25 (19.2%)	n/a
Self-consciousness/Embarrassment	45 (34.6%)	85 (65.4%)	n/a
Low Sugar	55 (42.3%)	62 (47.7%)	13 (10.0%)
Weight Gain	57 (43.8%)	61 (46.9%)	12 (9.2%)
Perceived shorter lifespan from insulin use	19 (14.6%)	78 (60.0%)	33 (25.4%)
Scarring	35 (26.9%)	90 (71.5%)	2 (1.5%)
Passing Out	39 (30.0%)	81 (62.3%)	10 (7.7%)

Table 1: Barriers to continuing insulin therapy.

The wide majority (90.8%) of insulin users believed that their diabetes was better controlled on insulin therapy while only 9 (6.9%) did not think so and 3 (2.3%) did not know. Age, ethnicity, education level, gender and RHA were not predictive of any of the barriers for persons on insulin (Adjusted odds ratio confidence intervals all inclusive of 1, in binary regression models). Of the users 53 (41.1%) also said they desired more information from their PCP about insulin therapy.

Non-insulin users: Of the 275 non-insulin patients when asked about their knowledge of insulin, 38% admitted to knowing nothing and 34.1% knew only a little. When asked which method of insulin administration would be preferred, 139 (50.9%) said they did not know, 96 (35.2%) preferred the pen and 32 (11.7%) preferred the syringe.

With regards to insulin initiation, Table 2 summarizes the main barriers. The need for more communication from their PCP concerning insulin therapy was expressed by 105 (38.5%) of non users.

Barriers to Initiation	Non-insulin Patient Response		
	Yes	**No**	**Don't Know**
Painful injection	153 56%	104 38.1	16 5.9
Fear of needles	147 54%	124 45.60%	1 (0.4%)
Self-consciousness/Embarrassment	77 28.20%	187 68.30%	9 (3.3%)
Hypoglycemia/Low sugar level	111 40.70%	72 26.4%	90 33.00%
Passing out	84 30.80%	84 (30.8%)	105 38.50%
Weight gain	63 23.10%	85 (31.1%)	125 45.80%
Scarring at injection site	102 37.40%	89 32.6%	82 30.00%
Perceived shorter lifespan from insulin use	26 6.40%	135 49.50%	112 41%
Cost	74 27.10%	100 36.60%	99 36.30%

Table 2: Barriers to initiating insulin therapy.

Patients were also asked if they thought their glucose levels would be better controlled on insulin, of which 119 (43.6%) said they thought it would be better controlled, 66 (24.2%) did not think so, while 88 (32.2%) did not know. In investigating whether or not insulin therapy would be time consuming, 168 (61.9%) thought it would not be, 69 (25.3%) thought it would be, and 36 (12.1%) did not know.

When asked about diet 68 (24.9%) thought that being on insulin therapy would make it more difficult to control their diet, 172 (63%) did not think so, and 33 (12.1%) did not know.

Patients were also asked to assess how much their daily life routine activities would be interfered with by insulin therapy. 55 (20.1%) felt that it would interfere a little, 26 (9.5%) felt that it would interfere a lot and 145 (53.1%) thought it would not interfere at all.

15% of non-users said their doctor had recommended insulin in the past to better control their diabetes and 54.6% of them said they would take insulin if it was ever recommended. Age, ethnicity, gender or RHA was not predictive of any of the barriers for non-users.

Table 3 shows some comparisons between users' experience and non-users' perceptions towards initiating therapy. Of note significantly more users thought insulin led to weight gain compared to non-users and a greater percentage of non-users perceived scarring as a complication at the injection site compared to users.

Factor	Insulin Users	Non-users	P values
	Experience	Perception	
Insulin administration is NOT painful	39.5 (51/130)	38% (104/275)	0.785
Insulin causes weight gain	43.8% (57/130)	23.1% (63/275)	< 0.001
Insulin leads to shorter life	14.6% (19/130)	6.4% (26/275)	0.123
Insulin causes scarring at the injection site	26.9% (35/130)	37.4% (102/275)	0.043
Insulin leads to attacks of Low Blood Sugar	42.3% (55/130)	40.7% (111/275)	0.71
Insulin interferes with daily activities	20.8% (27/130)	29.6% (81/275)	0.065
More communication is required about insulin therapy	41% (53/130)	38.5% (105/275)	0.618
Embarrassed about taking insulin	34.6% (45/130)	28.20% (77/275)	0.176

Table 3: Comparisons of insulin users experience and non-users perceptions with regards to key barriers.

Discussion

By examining the knowledge, attitudes and perceptions of DPs towards insulin therapy, this study was able to identify several factors in the primary care system of Trinidad that could explain in part why many DPs are not meeting best practice guidelines. These included limited knowledge concerning insulin therapy, failure to conduct regular and routine assessment of HbA1c values, inadequate education and limited access to alternative forms of insulin administration. Perception of insulin being painful, fear of needles, hypoglycemia, weight gain, scarring at injection sites and embarrassment were also specific barriers that were highlighted in this study. Both insulin users and non-users felt the need for more communication from their doctors about insulin therapy highlighting the need for further education about insulin therapy at the primary care level.

The vast majority of DPs did not know their last HbA1c result and the majority of these patients did not seem to understand what an "HbA1c result" meant. In addition, HbA1C values could only be found on file for less than half of patients. This lack of up to date HbA1c results was also highlighted in a study conducted in Trinidad by Ezenwaka et al., [19]. These results suggest that laboratory tests for glycosylated hemoglobin are not being conducted regularly and routinely within primary care centers in Trinidad. This limited availability of up to date HbA1c values is a cause for concern as it could lead to delays in the initiation and intensification of insulin therapy in DPs and could therefore have implications for the management of diabetes mellitus.

The results of this study also indicate inertia in the initiation and intensification of insulin therapy in Trinidad.

Recent studies such as one conducted by Asche et al., have indicated the benefits of early initiation and intensification of insulin therapy in patients with Type 2 diabetes mellitus [20]. This study found that in a subgroup of patients with an HbA1c > 10%, nearly half were not on insulin. Furthermore, HbA1c levels were significantly higher among insulin users which may suggest delayed initiation or suboptimal intensification. This may also be due to "resistance" towards insulin therapy, as some non-users admitted that their doctor did in fact recommend insulin in the past to better control their diabetes. Additionally, only half of non-users said they would take insulin therapy if it was ever recommended. Reasons for this "resistance" may be related to the barriers identified above.

Finally, there appeared to be limited access to alternative forms of insulin delivery such as pens and pumps which are associated with improved clinical outcomes. Compared to syringes, insulin pens have been shown to be more accurate, easier to use and associated with less pain while insulin pumps have been shown to decrease the chances of hypoglycemia and excessive weight gain [23,24]. The results of this study indicate that the overwhelming majority of insulin users administer it with a syringe, whereas only a few used the pen and none used the pump. Almost half of insulin users thought a pen device would be easier.

This study was the first to highlight KAP towards insulin therapy in a wide cross-section of DPs in the public health system of Trinidad. There was a high response rate and the sample was geographically diverse as it included both urban and rural areas throughout Trinidad, from all four RHA's.

Changes in practice

All DPs should be educated about insulin, its benefits and administration with the help of diabetes educators. A systematic review looking at self-management education programs in developing countries highlighted that such programs are effective in the short term but needs to be culturally tailored [25]. Based on this survey a structured educational intervention should be delivered to all DPs specifically addressing the perceived barriers identified above. Educational interventions can be individualised or delivered in groups to person with similar needs. A trial on insulin initiation proved that group therapy produced similar glycemic responses compared to individualized initiation. It was highlighted however that group therapy took one half as much time [26]. This may be an ideal way to implement insulin initiation in the local setting where time is already a limited resource in busy clinics. Education also need not be limited to the clinic. Given the high prevalence of risk factors for type 2 diabetes mellitus in Trinidadian children [27] (ages 7-18), the school environment may also be an ideal forum for education about diabetes, its complications and treatments.

Patients should also be made aware of the significance of HbA1c results and the advantages of alternative forms of insulin administration. Pens should be made available in the public health system as it is only available in the private sector. Although there are also some advantages to the insulin pump, high cost may limit its use in the Trinidad setting. HbA1c testing should also be made easily accessible and available for all health centers. Point of care HbA1c

testing has the potential to be a community friendly, accurate aid in diabetes management [28-30]. Ideally point of care testing with validated machines at each health centre should be established, ensuring that testing is done more regularly and routinely. Personnel and quality control measures would also need to be implemented to ensure its reliability and sustainability.

Limitations and new questions arising

Although this study included a large number of areas within Trinidad, no patients were surveyed in Tobago, therefore the study does not fully encompass KAP's towards insulin therapy on the less populous sister isle. In addition, this study did not measure Trinidad's private sector where differences may also exist in the education, knowledge and perceptions of patients towards insulin therapy, as well as availability of insulin pen devices. Further research should be conducted within Trinidad's private sector and in Tobago to investigate the KAP's of DPs and how this influences the management of diabetes mellitus in these settings. In addition to patient factors highlighted here, physician factors need to be identified as well which would contribute to ideal insulin management.

In conclusion, a lack of education about insulin therapy, limited HbA1c result availability, delays in the initiation and intensification of insulin therapy and inadequate access to more convenient forms of insulin administration pose significant challenges for the effective management of diabetes mellitus within Trinidad's public health sector. It is important that these issues be addressed through various interventions including public education about insulin therapy and its benefits, implementation of the necessary equipment and expertise for HbA1c testing in all clinics and increased investment in alternative forms of insulin administration such as insulin pens. By doing so, the initiation and intensification of insulin therapy could be done in a timely manner enabling patients to better manage their diabetes. Further research should focus on Trinidad's private health sector and Tobago as well as the physician population to elucidate further reasons for diabetes insulin mismanagement.

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Appendix I– PATIENT QUESTIONNAIRE

According to the National Diabetes Association of Trinidad and Tobago, there are as many as 175,000 persons with diabetes in Trinidad and Tobago. Although insulin is one of the primary treatments, many patients and physicians admit to indifference towards insulin therapy. Studies have been conducted on the knowledge, attitudes and perceptions of patients and primary care physicians in many countries including the US, UK and South Africa. However no such studies have been done here in Trinidad. We are conducting a survey to assess patient ' s knowledge, attitudes and perception towards insulin therapy. It would be greatly appreciated if you completed this brief questionnaire to aid in our investigations.

☐Male ☐Female

Age _____

Ethnicity: ☐ African ☐ Indian ☐ Caucasian ☐ Other

Education:

☐ Primary Level ☐ Secondary Level ☐ Tertiary Level ☐ Advanced Degree ☐ Professional

Certification

Address _____
_____

Health Center: _____
_____

Which Regional Health Authority (RHA) does the health center belong to:

_____

How long have you had diabetes?

___Years ___Months

Do you know your last HbA1c result?

☐ Yes ☐ No

What is it? _____ (To obtain most recent result from patient chart)

Are you currently on insulin therapy?

☐ Yes ☐ No

*If Yes, Answer Questions 1-18

*If No, Answer Questions 19- 32

INSULIN USERS

1. What type of insulin administering device do you use?

☐ Pen ☐ Pump ☐ Syringe

2. Do you think insulin administration with a pen device is easier compared to insulin syringes?

☐ Yes ☐ No ☐ Don't Know

3. How long have you injected insulin?
___Years ___Months

4. Number of injections per day?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ More than 4

5. If you had to inject insulin more frequently, would this trouble you?

☐ Yes ☐ No

6. Do you find it easy to take insulin the way you are taking it now?

☐ Yes ☐ No

7. Do you administer insulin to yourself?

☐ Yes ☐ No

8. Is insulin administration painful?

☐ Never☐ Sometimes☐ Most times☐ Always

9. Is your insulin therapy always free?

☐ Yes ☐ No

If "No" when you have to purchase your insulin is it expensive?

☐ Yes ☐ No ☐ Don't know

10. Are you self-conscious about taking insulin in public?

☐ Yes   ☐ No

11. Do you find insulin administration convenient?

☐ Yes ☐ No

12. Do you find it easy to take all the doses recommended by the doctor?

☐ Yes ☐ No

13. Are you following the insulin regimen/ guide recommended by the doctor?

☐ Yes ☐ No

14. Are you fearful of any of the following resulting from insulin?

☐ Low blood sugar (hypoglycemia) ☐ Yes ☐ No ☐ Don't know

☐ Weight gain ☐ Yes ☐ No ☐ Don't know

☐ Shorter life ☐ Yes ☐ No ☐ Don't know

☐ Scarring at the site of injection ☐ Yes ☐ No ☐ Don't know

☐ Passing out (coma) ☐ Yes ☐ No ☐ Don't know

15. How much does your current insulin treatment interfere with your everyday activities (social, leisure work or school activities?

☐ A little ☐ A lot ☐ Not at all

16. How much has your diet changed since you started insulin therapy?

☐ A little ☐ A lot ☐ Not at all

17. Do you think your diabetes is better controlled since you started insulin?

☐ Yes ☐ No ☐ Don't know

18. Have you ever felt the need for more communication from your doctor about your insulin therapy?

☐ Yes ☐ No

NON- USERS

19. How much do you know about insulin therapy?

☐ A great deal ☐ Some ☐ Little ☐ Nothing

20. Has your clinic doctor ever recommended insulin therapy to better control your diabetes?

☐ Yes ☐ No

21. If your doctor ever recommended insulin therapy to better control your diabetes would you take it?

☐ Yes ☐ No ☐ Don't Know

22. Do you think insulin therapy is expensive?

☐ Yes ☐ No ☐ Don't Know

If you had to take insulin therapy:

23. Would you be afraid of insulin needle injections?

☐ Yes ☐ No ☐ Don't Know

24. Do you think insulin injections would be painful?

☐ Yes ☐ No ☐ Don't Know

25. Do you think your glucose level would be better controlled on insulin?

☐ Yes ☐ No ☐ Don't Know

26. Do you feel that taking insulin injections would be time consuming?

☐ Yes ☐ No ☐ Don't Know

27. Do you think it would be difficult to control your diet if on insulin therapy?

☐ Yes ☐ No ☐ Don't Know

28. Would you feel embarrassed by taking an insulin injection in public?

☐ Yes ☐ No ☐ Don't Know

29. Do you feel insulin therapy can result in any of the following?
  ☐ Low sugar ☐ Yes ☐ No ☐ Don't Know
  ☐ Passing out (coma) ☐ Yes ☐ No ☐ Don't Know
  ☐ Weight Gain ☐ Yes ☐ No ☐ Don't Know
  ☐ Scarring around injection sites ☐ Yes ☐ No ☐ Don't Know
  ☐ Shorter life ☐ Yes ☐ No ☐ Don't Know

30. Do you think insulin treatment would interfere with everyday activities (social, leisure work or school activities?

☐ A little ☐ A lot ☐ Not at all ☐ Don't Know

31. If insulin therapy was suggested for you which method of administration would you prefer?

☐ Pen ☐ Pump ☐ Syringe ☐ Don't Know

32. Have you ever felt the need for more communication from your doctor about insulin therapy?

☐ Yes ☐ No