



Patient perception towards shifting oral antihyperglycemic agents to injectable insulin and associated factors in the diabetes clinic of Tikur Anbessa specialized hospital: Cross-sectional study

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ABSTRACT

Background: With the growing understanding of the importance of preserving adequate glycemic control for the prevention of long-term diabetes-related complications, insulin therapy has become increasingly recommended for type 2 diabetes. However, insulin use in various healthcare settings remains low due to patients' low levels of acceptability of insulin therapy, which necessitates evaluating patients' attitudes.

Objective: To assess patients' perception toward shifting oral antihyperglycemic agents to insulin and associated factors at the ambulatory diabetes clinics of Tikur Anbessa Specialized Hospital (TASH).

Method: A cross-sectional study design was applied using a pre-tested interviewer-administered questionnaire on adult type 2 diabetes patients on follow-up at the diabetes clinic of TASH, Ethiopia from July to September 2021. The questionnaire tool was adapted from Insulin Treatment Appraisal Scale with modifications to fit the purpose of the study. Data was gathered, cleaned up, entered, and analyzed using Statistical Package for the Social Sciences (SPSS) version 23 for descriptive and logistic regression. For logistic regression data, a p-value of 0.05 was used to determine the statistical significance.

Result: Of 293 patients, 65.9% were female. Study participants had a mean age of 53.9 ± 10.9 years. About 45% and 75% of the participants have complications and comorbidities, respectively with a mean disease duration of 19.16 ± 8.2 years. Almost 54% of patients on oral antihyperglycemic agents were unwilling to start insulin. A perception score below the median was observed in 56.3% of the respondents. Patients with primary and secondary education were 45% and 42% less likely to have a poor perception of shifting oral antihyperglycemic agents to insulin than those who couldn't read or write ($P < 0.05$), respectively. The study found that participants who were taking only oral antihyperglycemic agents had a 2.76 times poor perception than those who are on insulin treatment ($P < 0.001$).

Conclusion: Poor perception toward shifting oral antihyperglycemic agents to insulin was found to be high among study participants. It was substantially correlated with low educational attainment, financial constraints, exclusively using oral antihyperglycemic agents, duration of disease, and absence of disease complications.

1. Introduction

Type 2 diabetes (T2DM) is the most prevalent, generally affecting adults, and arises when the body develops insulin resistance or fails to produce enough insulin [1,2]. The prevalence of T2DM has grown substantially in nations of all economic levels during the past three decades [2]. It is responsible for 90–95% of all diabetes cases. Diabetes affects around 422 million people globally, with the majority residing in low- and middle-income countries, and is directly responsible for 1.6 million fatalities per year [3]. Patients with diabetes are also at a higher

risk of developing other ailments, such as heart, peripheral arterial, and cerebrovascular disease [4]. In Ethiopia, as indicated by a few communities and institution-based studies, as high as 6.5% diabetes prevalence was reported in Addis Ababa, while 5.1% in an urban setting and 2.1% in the rural setting of Northwest Ethiopia have been reported [5].

Oral antihyperglycemic agents (OAHAs), along with diet and exercise, are first-line treatments for T2DM to achieve target glycemic control and prevent both microvascular and macrovascular complications [6]. Insulin treatment is indicated for individuals with T2DM who have an initial A1C result of more than 9% or whose diabetes is uncontrolled

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after using the best oral glyceic medication. If the A1C is above 7.0% despite the use of OAHAs, a balanced diet, and a healthy lifestyle, insulin should be begun after 2–3 months of dual oral therapy [7]. Starting insulin therapy in a newly diagnosed patient with T2DM is unusual, but it should also be taken into account if there has been a considerable loss of weight, there are severe signs of hyperglycemia, or there is a significant increase in ketonuria [8]. For successful insulin treatment, rapid titration of the dosage, in addition to an early start, is essential [7]. However, this is commonly delayed owing to a number of reasons. Many T2DM patients avoid insulin therapy even when it is needed [9].

Both patients and practitioners can pose obstacles to the start of injectable treatment. Anxiety and fear of injection-related discomfort have been reported to impact 30–50% of patients to the start of insulin. Other roadblocks include worries regarding injectable therapy's capacity to be administered, therapeutic side effects, and quality of life implications. Understanding patient perspectives, improving education, and establishing reasonable expectations for therapy could all help lower the obstacles to injectable treatment for T2DM. Some of the methods for lowering fear and anxiety associated with injections include assessment, patient education, behavioral therapy, and monitoring [10–12].

A study conducted in Ethiopia showed that some individuals put off starting diabetes treatment for a variety of reasons, including a lack of acceptance of their diagnosis. As a result, they leave therapy early on and terminate it on a regular basis. Other individuals declined to accept insulin suggestions, expressing concerns about potential consequences and side effects and associating it with a high level of disease severity [13].

While previous studies have explored about the perceptions of patients on insulin therapy, the exact magnitude of perception and associated factors in shifting OAHAs to insulin is not yet fully discovered [14]. In addition, the factors associated with shifting toward insulin vary from time to time and place to place, which might be associated with the socioeconomic status of patients [15]. These factors put a gap in the use of insulin in the management of type 2 DM. The purpose of this study is to assess the perception of diabetes patients towards shifting OAHAs to injectable insulin at the diabetes clinic of TASH. This study helps healthcare providers understand perceptions regarding injectable hypoglycemic medicines as well as improve medication adherence and quality of life for patients.

2. Methods

2.1. Study design and population

In this study, a hospital-based cross-sectional study design was applied using a self-administered questionnaire to patients on follow-up at the diabetes clinic of Tikur Anbessa specialized hospital (TASH), Addis Ababa, Ethiopia. TASH is the country's biggest referral hospital, with 700 beds. The TASH is currently the primary teaching hospital for most specialties, providing both clinical and preclinical instruction. Yearly, 6000 patients visit the diabetes clinic. The study was conducted from July to September 2021. The source population for this study was adult diabetes patients who had a follow-up at the TASH diabetes clinic. The study includes all adult T2DM patients who had a follow-up at TASH during the study period and fulfilled the inclusion criteria (willing to participate in the study, and currently on any pharmacological treatment for T2DM). Pregnant women, critically ill patients, and type 1 diabetes patients were excluded from the study.

2.2. Sample size and sampling technique

A sample size was computed based on a single proportion formula, assuming a prevalence (p) of 50%, as there was no research conducted on this topic in Ethiopia and neighboring countries. A z-value of 1.96 was used at 95% CI and a d of 5%. (n = sample size, p = prevalence, and

d = margin of error).

$$n = \frac{Z^2 p (1 - p)}{d^2} = \frac{(1.96)^2 \times (0.5) (0.5)}{(0.05)^2} = 384$$

Since the total population is below 10,000, which is 6000. The final sample size (reduction formulas) can be given as (where nf -final sample size, n -total study population, N - a source of the population):

$$nf = \frac{n}{1 + n/N} = \frac{384}{1 + 384/6000} = 361$$

Therefore, a final sample size of 361 participants was targeted. Patients who participated in the study were sampled using convenience sampling.

2.3. Data collection and management

Socio-demographic variables (gender, age, religion, educational status, occupation, income and, health insurance) and clinical characteristics of study participants (comorbid disease and complications, duration of disease, number of medications, and level of glucose control) were collected using a structured, self-administered questionnaire that was developed to be answered by patients. The questionnaire tool was adapted from the Insulin Treatment Appraisal Scale with modifications in order to fit the purpose of the study [16]. Based on this, 17 perception questions were developed to assess patients' perceptions toward shifting OAHAs to insulin. The questionnaire was created in English with all the necessary information and then translated into Amharic. To improve the quality of the responses, the data collection tool was pre-tested on 5% of the sample size at the TASH diabetes clinic. Based on the response, an amendment was made to the final questionnaire. The training was also provided for data collectors. On a daily basis, the principal investigator (PI) was closely supervising data collection.

2.4. Operational define

Good perception: If the patient's total score in response to the 17 perception questions is higher than the median score, they were classified as having good perception.

Poor perception: If the patient's total score in response to the 17 perception questions is lower than the median score, they were classified as having poor perception.

2.5. Data analysis

The collected data was checked for completeness, cleaned, coded, and entered into the Statistical Package for the Social Sciences (SPSS) version 23 software for analysis. Then, descriptive statistics for continuous and categorical variables were performed, and the results were reported as frequency, percent, mean, and standard deviation (SD). Logistic regression tests were used to assess the association between independent variables and patient perception of the shift from oral hypoglycemic medication to injectable insulin. To reduce the impact of confounding variables, multiple logistic regression was applied to the variables with significant p-values from the binary logistic regression. A p-value of 0.05 was used to determine the 95% CI and the statistical significance level.

2.6. Ethical consideration

The study was carried out after receiving ethical permission from the Institutional Review Board of Addis Ababa University College of Health Sciences School of Pharmacy (Ref. No.: ERB/SOP/330/13/2021). The Declaration of Helsinki's guidelines were followed. Also, written and oral or verbal consent was taken from every participant. The patient's name and address were excluded from the data collection checklist.

Table 1

Socio-demographic and clinical characteristics of adult diabetes patients on follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia (N = 293).

Variables		N (%)
Gender	Female	193(65.9)
	Male	100(34.1)
Age(years)	Mean(SD)	53.9(±10.9)
	30–45	80(27.3)
	46–60	124(42.3)
	61–80	89(30.4)
Educational level	College diploma and above	73(24.9)
	Secondary school	63(21.5)
	Primary school	104(35.5)
	Reads and write	21(7.2)
	Unable to write and read	32(10.9)
Occupation	Employed	66 (22.5)
	Unemployed	135 (46.1)
	Pension	49 (16.7)
	Private	42 (14.3)
	Student	1 (3)
Insurance	Insured	242(82.6)
	Uninsured	51(17.4)
Monthly income(ETB)	<1000	112(38.2)
	1000–3000	59(20.1)
	3000–5000	64(21.8)
	5000–7000	29(9.9)
	7000–10,000	14(4.8)
	>10,000	15(5.1)
Smokers	No	284(96.9)
	Yes	9(3.1)
Alcohol consumption	No	275(93.9)
	Yes	15(5.1)
Level of glucose Control	Poor	23(7.8)
	Fair	97(33.1)
	Good	142(48.5)
	Very Good	25(8.5)
	Excellent	6(2)
Complications	No	159(54.3)
	Yes	134(45.7)
Number of complications	One	115(39.2)
	Two	17(5.8)
List of Complications	Nephropathy	64(49.6)
	Retinopathy	27 (5.8)
	Neuropathy	55(18.7)
Comorbidities	No	73(24.9)
	Yes	220(75.1)
List of comorbidities	Dyslipidemia	148(50.5)
	Hypertension	177(60.4)
	Other	61(20.8)
Number of comorbidity	One	67(22.9)
	Two	127(43.3)
	Three	22(7.5)
	Four	2(7)
Duration of disease(years)	Mean(SD)	19.16(±8.2)
	≤5	36(12.3)
	6–10	18(6.1)
	11–15	30(10.2)
	16–20	37(12.6)
	21–25	104(35.5)
	>25	68(23.2)

Keys: ETB: Ethiopian birr, SD: standard deviation.

3. Result

Out of the 361 questionnaires distributed to study participants, 293 questionnaires were adequately filled out, yielding a response rate of 81.16%. Out of the 293 patients, 193 (65.9%) were female. The study participants' mean age was 53.9 (SD, 10.9), of which most were in the age group of 46–60 years. The majority of the participants (46.1%) were unemployed and insured (82.6%) by the government. The majority of the participants (48.5%) claim to have good glucose control. In addition, about 45% of the participants have complications, and 75.1% of the participants have comorbid illnesses. Only 28% of the participants did not take insulin. More than half of the study participants had diseases

Table 2

Medication of adult diabetes patients on follow up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia (N = 293).

Variables		N (%)
Types of medication	Insulin	107(36.5)
	Oral antihyperglycemic agents	82(28)
	Both	104(35.5)
List of current medication	Metformin	185(63.1)
	Glabinclamide	44(15)
	RI	62(21.2)
	Mixtard	5(1.7)
	NPH	208(71)
Currently on insulin	No	89(30.4)
	Yes	204(69.6)
Time lag for insulin treatment	No	189(64.5)
	Yes	20(6.8)
Duration of time lag for insulin treatment	1 year	7(2.4)
	2 year	6(2)
	3 year	1(0.3)
	4 year	5(1.7)
	5 year	4(1.4)
	I don't know	2(0.7)
Willingness to start insulin	No	64(54.2)
	Yes	54(45.8)
Reasons to refuse insulin	Fear of weight gain	2(0.7)
	Fear of hypoglycemia	5(1.7)
	Fear of injection	55(18.8)
	Social embarrassment	5(1.7)
	Others	28(9.6)
Treatment can help illness	No	38(13)
	Yes	233(79.5)
Illness duration	Not so long	12(4.1)
	life long	265(90.4)
	I don't know	1(0.3)
Insulin is end stage therapy	Neutral	41(14)
	Agree	16(5.5)
	disagree	236((80.5)
Overall perception	Good perception	122 (43.7%)
	Poor perception	157(56.3)

Keys: NPH- Neutral Protamine Hagedorn insulin; RI- Regular insulin; SD—standard deviation.

that lasted more than 20 years, with a mean disease duration of 19.16 (SD, 8.2) years. The participants' sociodemographic information and clinical characteristics are summarized in [Table 1](#).

In this study, around 70% of study participants were on insulin therapy, although about seven percent had a time lag of more than a year. In the assessment question about willingness to begin insulin, almost 54% were opposed to insulin commencement. Fear of injections was the most often cited excuse given by respondents (18.8%) for not starting insulin. Out of the 17 perception questions, the respondents' overall perception scores ranged from 0 to 2, with a median perception score of 1.1. A perception score greater than or equal to the median is achieved by 122 (43.7%) of the respondents as a good perception, as shown in [Table 2](#). The participant's perception towards insulin using the 17-perception assessment questionnaire is also described in [Fig. 1](#).

According to the logistic regression analysis results, participants who had primary and secondary education were 45% and 42% less likely to have a poor perception toward shifting OAHAs to insulin as compared to those who were unable to read and write ($P < 0.05$), respectively. Furthermore, individuals who have insurance were about 30% less likely to have a poor perception toward switching from OAHAs to insulin (OR (95% CI); 0.70(0.54, 0.91)). The study found that participants who are not currently taking insulin have a 2.76 times poor perception than those who are on insulin treatment ($P < 0.001$). In this study, variables such as the absence of disease complications, the duration of the disease, and the patient's assumption that insulin is an end stage medication were all substantially associated with poor perception toward switching from OAHAs to insulin ($P < 0.05$) ([Table 3](#)).

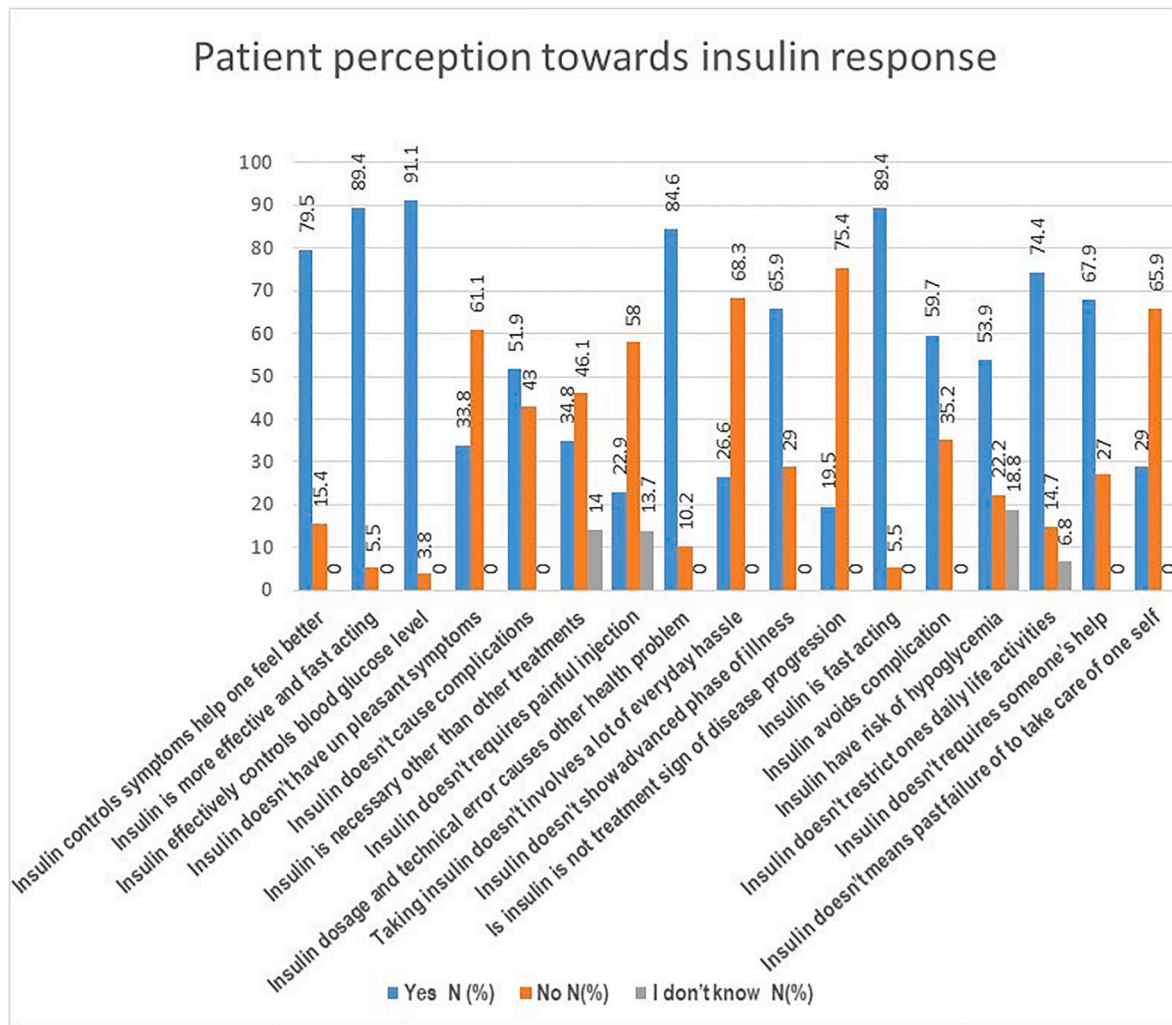


Fig. 1. Patient perception towards insulin among adult diabetes patients on follow up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia (N = 293).

4. Discussion

Insulin therapy has been mostly affected by patients' acceptance levels [12]. Knowing the perspective of patients toward insulin therapy is important to overcome the problem. Therefore, the purpose of the current study is to assess the patients' perception toward shifting OAHAs to injectable insulin and the factors associated with it.

In the current study, the percentage of diabetes patients who refused insulin treatment was more than half. This result is consistent with research done in Singapore among Asian diabetes patients' about perceptions of insulin therapy, which found that more than two-thirds of them were unwilling to use the medication [17]. The rejection rate in this study is significantly higher than that in the Kingdom of Saudi Arabia, where only 24.4% of diabetics refused to take insulin [12]. These variations might be associated with differences in inclusion criteria, sample size, and study participants' level of awareness.

In clinical practice, the start of insulin therapy frequently encounters difficulty and rejection. In this study, fear of injections was the most often cited excuse for not taking insulin treatment. Similarly, in a study conducted in the Caribbean nation of Trinidad, Libya, Saudi Arabia, and France among diabetes patients, the perception of painful injections was a barrier to starting insulin therapy [12,18–20]. This aspect should be properly addressed through education, particularly about insulin injection practice. It has a direct influence on adherence, which affect the outcome of treatment.

In this survey, about 46% of student participants believe that insulin

was not more necessary than OAHAs to replace it. In addition, about 54% of participants believe that insulin increases the risk of hypoglycemia, which is greater than among Asian patients (35.3%) [17], French patients (24%) [18], and Trinidad patients (40.7%) [19]. Fear of additional problems from insulin therapy was as prevalent as 48.1% among the study the participants, which is comparable with Asian (54.5%) and French patients (44%) [17,18]. Therefore, this poor perception should be averted because it affects the benefits of early beginning and augmentation of insulin therapy in patients with especially in T2DM patients who require the treatment [21].

In this survey, the most common favorable perceptions of insulin treatment use were that it is more effective and fast acting (89.4%) for the patients, that it successfully regulates blood glucose levels on (91.1%) of patients, and that it does not restrict one's everyday activities on (74.4%) of patients. In research among Trinidadians, the vast majority (90.8%) of insulin users thought that insulin therapy improved their diabetes management [19].

In this survey, it was observed that 56.3% of research participants had poor overall perception status. The finding from the logistic regression analysis showed that, people with primary and secondary education status were 45% and 42% less likely to have poor perception toward shifting OAHAs to insulin, respectively, as compared to those who were unable to read and write (P < 0.05). Similarly, studies in Libya and India found that lower education levels were associated with poor perception [20,22]. This is because as the literacy level increases the level of awareness about diabetes and its treatment will be improved.

Table 3
Association of socio-demographic and clinical characteristics and perception among adult diabetes patients on follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia (N = 293).

Variables		Poor perception N(%)	Good perception N(%)	P-value	OR (95% C.I)
Age(years)	30–45	42(15.1)	33(11.8)	0.30	0.79 (0.50, 1.24)
	46–60	67(24)	49(17.6)	0.10	0.73 (0.51, 1.06)
	61–80	48(17.2)	40(14.3)	Ref.	
Gender	Male	53(19)	43(15.4)		
	Female	104(37.3)	79(28.3)	0.07	0.76 (0.57, 1.02)
Education status	Unable to write and read	13(4.7)	17(6.1)	Ref.	
	Reads and write	7(2.5)	14(5)	0.13	2.00 (0.81, 4.96)
	Primary school	38(13.6)	21(7.5)	0.03	0.55 (0.32, 0.94)
	Secondary school	62(22.2)	36(12.9)	0.01	0.58 (0.39, 0.88)
	College diploma and above	37(13.3)	34(12.2)	0.72	0.92 (0.58, 1.46)
Insurance	Uninsured	22(7.9)	28(10)	Ref.	
	Insured	135(48.4)	94(33.7)	0.01	0.70 (0.54, 0.91)
Complication	Yes	69(24.7)	59(21.2)	Ref.	
	No	88(31.5)	63(22.6)	0.04	0.72 (0.52, 0.99)
Comorbidities	Yes	121(43.4)	90(32.3)	Ref.	
	No	36(12.9)	32(11.5)	0.63	0.89 (0.55, 1.43)
Duration of disease (years)	≤5	24(8.6)	11(3.9)	0.03	0.46 (0.23, 0.94)
	6–10	13(4.7)	5(1.8)	0.07	0.39 (0.14, 1.08)
	11–15	19(6.8)	10(3.6)	0.10	0.53 (0.25, 1.13)
	16–20	14(5)	19(6.8)	0.39	1.36 (0.68, 2.71)
	21–25	61(21.9)	37(13.3)	0.02	0.61 (0.40, 0.91)
Current medication	>25	26(9.3)	40(14.3)	Ref.	
	Oral anti-hyperglycemic	19(6.8)	53(19)	Ref.	
	Both oral and insulin	74(26.5)	26(9.3)	0.00	0.35 (0.23, 0.55)
	Insulin	64(22.9)	43(15.4)	0.04	0.67 (0.46, 0.99)
Currently taking insulin	Yes	136(48.7)	64(22.9)	Ref.	
	No	21(7.5)	58(20.8)	0.00	2.76 (1.68, 4.55)
Time lag for insulin	Yes	12(5.9)	8(3.9)	Ref.	
	No	126(61.5)	59(28.8)	0.00	0.47 (0.34, 0.64)
	Yes	22(20)	28(25.5)		

Table 3 (continued)

Variables		Poor perception N(%)	Good perception N(%)	P-value	OR (95% C.I)
Willing to start insulin as treatment	No	19(17.3)	41(37.3)	0.01	2.16 (1.25, 3.72)
Insulin end stage therapy	Disagree	142(50.9)	94(33.7)	Ref.	
	Neutral	8(2.9)	20(7.2)	0.03	2.50 (1.10, 5.68)
	Agree	7(2.5)	8(2.9)	0.80	1.14 (0.41, 3.15)

Keys: OR: Odds ratio; Ref.: Reference.

The higher the education level, the greater the amount of prior knowledge, and the greater the understanding of material provided throughout a diabetes education program.

In this study, individuals who have insurance were about 30% less likely to have a poor perception toward switching from OAHAs to insulin. The patient’s financial situation may be related to their refusal of insulin therapy. Similarly, the study conducted in Cape Town showed that financial constraint was one of the barrier for initiating insulin among study participants [23]. The study also found that participants who are not currently taking insulin have a 2.76 times poor perception than those who are on insulin treatment (P < 0.001). In line with the current study, a systematic review and meta-ethnography of patient perspectives toward insulin revealed that acceptance of insulin improved once the medication was started [14]. A thematic synthesis of studies on perceptions of insulin use also indicated that the beliefs about insulin and experiences in using insulin were the most significant barriers to insulin usage [24]. According to a study done among Chinese individuals, patients on anti-hyperglycemic drugs had more unfavorable perceptions and beliefs toward insulin therapy than patients receiving treatment with insulin [25]. The good perception among insulin-treated patients could be attributed to the education given to those on insulin. Therefore, to close this gap, multimodal measures such as enhanced patient education and the development of integrated insulin support systems are required.

In this study, variables such as the absence of disease complications, the short duration of the disease, and the patient’s assumption that insulin is an end-stage medication were all substantially associated with poor perception toward switching from oral antihyperglycemics to insulin (P < 0.05). Similarly, an Indian study found that people assume that taking insulin always signifies that their diabetes has worsened [22]. Some people even believe that insulin initiation is a punishment for poor blood glucose control. To enhance these patients’ misconceptions about insulin therapy, an organized diabetes education program is essential. In contrast to the current findings, a study done in Libya’s capital city of Tripoli revealed that the advancement of disease was unrelated to patient perception [20]. This discrepancy may be the result of the small sample size and the inclusion of participants on both OAHAs and insulin in the current study.

Contrary to the present findings, a study from China and Libya revealed that perception was unrelated to the duration of the disease [20,25]. This variation could be attributed to differences in study participants’ awareness of diabetes and insulin, different instruments used to assess perception, and differences in sample size. In agreement with current findings, a study conducted in Saudi Arabia, France, and Germany found that as the duration of the disease increased, so did the perception of insulin therapy [12,18,26]. This could happen because patients are more likely to receive insulin as their disease progresses. The progressive nature of diabetes makes treatment challenging since β cell function gradually deteriorates over time. As a result, OAHAs alone are unable to appropriately control blood glucose levels, forcing patients to eventually receive insulin therapy in order to treat their diabetes [27].

Therefore, a multidisciplinary team with an evidence-based protocol should be established to facilitate and support the patient's insulin therapy.

5. Limitations

This study has some limitations, despite the fact that it provides important information about patients' perceptions of shifting from OAHAs to insulin and the factors involved. The small sample size is one of the limitations of this study, which influences the power of the study to draw conclusions. It is also a single-center study, which might limit generalizations to the whole population. Another limitation could be getting patients' honest perceptions since data was collected cross-sectionally using self-report questionnaires. The majority of research participants did not recognize their antihyperglycemic medications and instead identified them using Amharic terminology for pill (kinin), size, color, and injection (merfe, difiris etc.).

6. Conclusion

Overall, 56.3% of study participants had poor perceptions about shifting OAHAs to insulin therapy. The most common reason for insulin refusal is injection site pain, which can have a direct impact on a patient's adherence, attitudes, and beliefs. Low educational status, financial constraints, usage of solely OAHAs, short duration of disease, and lack of disease complication were all highly associated with a poor perception of switching OAHAs to insulin therapy.

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CRedit authorship contribution statement

Zenebe Negash: Conceptualization, Methodology, Data curation, Formal analysis, Writing – review & editing, Supervision. **Tsion Mekonen:** Conceptualization, Methodology, Data curation, Formal analysis, Investigation, Writing – original draft, preparation, All authors have read and agreed to the published version of the manuscript.

Declaration of competing interest

The authors have no conflict of interest to disclose.

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