

Clinical inertia in insulin prescription for patients with type 2 diabetes mellitus among family physicians in Saudi Arabia

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Abstract

Objective: To explore the knowledge and perceptions of primary care physicians about clinical inertia in the management of type 2 diabetes, and to identify the contributing factors.

Method: The cross-sectional study was conducted in Madinah, Saudi Arabia between April and May 2020, and comprised qualified doctors working in primary care centres as general practitioners or board-certified family physicians. Data was collected using a questionnaire on participants' demographics, knowledge and practices related to diabetes management, and their perceptions regarding clinical inertia in the management of type 2 diabetes. The questionnaire was distributed online. Data was analysed using SPSS 28.

Results: Of the 250 subjects approached, 200 (80%) completed the questionnaire; 105(52.5%) males and 95(47.5%) females. There were 78 (39%) subjects aged 41-50 years. Overall, 90(45%) subjects were general practitioners, 41(20.5%) were family medicine specialists, and 62(31%) were family medicine consultants. Of the total, 96(48%) respondents were aware of the concept of therapeutic inertia. Factors contributing to inertia were identified at the patient, physician and system levels.

Physician-related factors included concern about hypoglycaemia 129(64.5%), complexity of treatment 111(55.5%), and patient refusal 67(33.5%). Patient-related barriers were resistance to lifestyle modifications 132 (66.0%), fear of weight gain 105(52.5%), and fear of injections 101(50.5%). System-level barriers included lack of multidisciplinary teams 137(68.5%), time constraints 107 (53.5%), and high workload 104(52.0%). A significant association was found between professional classification and awareness of therapeutic inertia ($p < 0.05$).

Conclusion: Addressing barriers at the physician and system levels could help reduce clinical inertia in insulin prescription, potentially leading to improved diabetes outcomes.

Key Words: Type 2 diabetes, Diabetic therapeutic inertia, HbA1c, Primary care, Physicians, Clinical inertia.

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Introduction

Type 2 diabetes mellitus (T2DM) is a lifelong disease that represents a major public health problem worldwide. Achieving glycaemic control is widely acknowledged as the key goal of treatment in T2DM, and is critical for reducing the onset and progression of diabetes-related complications, such as cardiovascular diseases (CVDs), neuropathies, retinopathies and nephropathies.

There are an increasing number of sophisticated treatment options available for T2DM management that can lead to uncertainty among medical professionals and the phenomenon known as therapeutic inertia (TI).¹ New anti-diabetic medications with proven benefits on the

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cardiovascular and renal systems, like sodium-glucose transport protein 2 (SGLT2) inhibitors and glucagon-like peptide-1 (GLP-1) receptor agonists, have to be prescribed to high-risk T2DM patients.²

The failure of healthcare providers to initiate, intensify, or de-intensify therapy when necessary is known as therapeutic inertia, which may prolong the duration of patients' hyperglycaemia. This subsequently puts them at increased risk of diabetes-associated complications and reduced life expectancy. TI is influenced by multiple factors, including hesitancy among primary care physicians (PCPs) in intensifying drug treatment despite unmet glycaemic targets. Some PCPs may overestimate patient resistance to treatment adjustments and tend to delay insulin initiation, even when glycated haemoglobin (HbA1c) levels remain elevated. Studies indicate that familiarity with insulin therapy varies among PCPs, potentially contributing to suboptimal insulin initiation and intensification strategies.³

The term "legacy effect", which means good control of hyperglycaemia early and at the beginning of the disease

will reflect in a decrease in long-term diabetic complications.²

The failure to initiate or intensify treatment when necessary can lead to 30-50% patients experiencing years of suboptimal glycaemic control before treatment is escalated.⁴

Early in the condition, there are specific recommendations for diet and lifestyle changes. A more customised approach to treatment is necessary as the disease worsens and there are increasing co-morbidities, such as renal and cardiovascular diseases. The quality of life (QOL) gets increasingly compromised among the elderly diabetics. TI may result owing to deviance from clinical recommendations, a lack of expertise or knowledge, or failure to receive specialised care.⁵ Psychological resistance to insulin also plays a role in TI.⁶

A study found that health system related causes were the least common in comparison to the other causes (20%), followed by the patient-related causes (30%), while the physician-related causes have also been shown to be the most common contributors (50%)^{1,7}. A good patient-doctor relationship based on proper communication skills and decision making ability of the PCP plays a role in overcoming TI.⁸

TI exists at all stages of care, but it becomes more pronounced when injectable treatments are required. It is worthwhile to increase the skill level of PCPs to prevent TI. To our knowledge, no research focussing entirely on PCPs and TI even though this group is increasingly being prioritised for handling sophisticated diabetic care in the community, albeit with assistance from experts.⁹ The current study was planned to explore the knowledge and perceptions of PCPs about TI in the management of T2DM, and to identify the contributing factors.

Subjects and Methods

The cross-sectional study was conducted in Madinah, Saudi Arabia, between April and May 2020, and comprised qualified doctors working in primary care centres as general practitioners (GPs) or board-certified family physicians (FPs).

Data was collected using a questionnaire consisting of 4 sections covering demographic and professional details, knowledge levels, practices in the management of T2DM, and PCPs' opinions regarding the cause of TI. The questionnaire was distributed online and included an informed consent form. Those who did not return the form filled were excluded. The study was approved by the Institutional Review Board (IRB) General Directorate of Health Affairs in Madinah, Registered at the US

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The sample was raised using a convenience sampling technique, and approached PCPs working in Madinah. This approach was chosen to ensure adequate participation given the practical constraints of recruiting PCPs.

The sample size was calculated using the Raosoft sample size calculator¹⁰, considering a 5% margin of error, an 80% confidence level, and a response distribution set at maximum uncertainty (50%). Based on these parameters, the minimum required sample size was 163 physicians. To account for potential non-response, the questionnaire was distributed to 250 physicians. A total of 200 physicians completed the survey, yielding an effective response rate of 80%.

The questionnaire was piloted on a sample of 20 PCPs who were not included in the final analysis. The pilot study was conducted to assess the validity and reliability of the instrument. Minor modifications were made based on participant feedback to improve clarity and comprehension of the questions. The reliability of the questionnaire was evaluated using Cronbach's alpha, which yielded a value of 0.82, indicating good internal consistency.

To assess the adequacy of knowledge and practice among the PCPs, a 4-point score was calculated for each participant based on the answers to specific knowledge and practice questions where each correct answer was given one point, and an incorrect answer was given zero point. Causes of diabetic TI were divided into physician-related, patient-related, and system-related factors.^{1,11}

Data was analysed using SPSS 28. Continuous variables were presented as mean +/- standard deviation, if normally distributed. Non-normally distributed data was expressed as median with interquartile range (IQR). Categorical variables were described using frequencies and percentages. Chi-square test was used to compare categorical variables, while numerical data was compared using the Mann-Whitney U test or the Kruskal-Wallis test. $P < 0.05$ was considered significant.

Results

Of the 250 subjects approached, 200(80%) completed the questionnaire; 105(52.5%) males and 95(47.5%) females. There were 78(39%) subjects aged 41-50 years. Overall, 90(45%) participants were GPs, 41(20.5%) were family medicine specialists, and 62(31%) were family medicine consultants (Table 1).

Table-1: Baseline characteristics.

Study variables	N (%) (n=200)
Age group in years	
22-30 years	20 (10%)
31-40 years	66 (33 %)
41-50 years	78 (39 %)
51-65 years	36 (18 %)
Gender	
Male	105(52.5 %)
Female	95(47.5 %)
Professional Classification and Registration Rank	
General Practitioner (GP)	90 (45%)
Family Medicine Specialist	41(20.5 %)
Family Medicine Consultant	62 (31%)
Other	7 (3.5 %)
Total years of practicing medicine	
Less than 5 years	16 (8%)
5 to <10 years	50 (25%)
10 to <15 years	46 (23%)
15 to <20 years	30 (15%)
More than 20 years	58 (29 %)

Among the PCPs, 197(98.5%) were managing T2DM cases at their respective centres. The mean number of T2DM cases managed per week was 25.9+/-20.3, whereas the mean number of newly diagnosed cases per week was 3.9+/-8.2). The mean number of T2DM patients managed with insulin therapy per week was 9.9+/-9.8, and the mean number of complicated T2DM cases per week was 2.3+/-1.96.

Regarding the T2DM management pattern, 180(90%) PCPs agreed that metformin should be started at the time of T2DM diagnosis unless there is a contraindication, and 165(82%) considered early aggressive treatment more beneficial for the patients. When asked about the optimum control target, 190(95%) targeted an HbA1c level of <7%, whereas 185(92.5%) individualised HbA1c targets according to the patient's age and other comorbidities. Further, 169(84.5%) of the participants considered insulin initiation if the blood glucose level exceeded 300mg/dL, while 183(91.5%) considered initiating insulin if HbA1c was >10%. Regarding awareness of diabetic TI, 96(48%) PCPs were aware of the term, whereas 104(52%) were unaware of it. More than half of the participants 115(57.5%) reported attending diabetes educational meetings, while 65(32.5%) did not attend, and 20(10%) were unaware of such meetings (Table 2).

In the case of oral therapy that did not achieve the target level, 133(66.5%) participants switched to insulin therapy within 3 months, 56(28%) waited for 3-6 months, and 10(5%) waited for 6-12 months. Around half of the

Table-2: Management practices regarding type 2 diabetes mellitus (T2DM).

Study variables	N (%) (n=200)
Metformin should be started at the time of diabetes diagnosis unless there are contraindications	
Yes	180 (90%)
No	11 (5.5%)
Do not know	9 (4.5%)
Considering early aggressive control more beneficial for the patient	
Yes	165 (82%)
No	25 (12.5%)
Do not know	10 (5%)
Targetting Hba1c <7% as optimal control	
Yes	190 (95%)
No	9 (4.5%)
Do not know	1 (0.5)
Individualized target HbA1c (patient age and comorbidities)	
Yes	185 (92.5%)
No	8 (4%)
Do not know	7 (3.5%)
Considering initiate insulin if blood glucose >300mg/dL (16.7mmol/L)	
Yes	169 (84.5%)
No	29 (14.5%)
Do not know	2 (1%)
Considering initiating insulin if HbA1c >10%	
Yes	183 (91.5%)
No	13 (6.5%)
Do not know	4 (2%)
Attending formal education regarding Diabetes	
Yes	115 (57.5%)
No	65 (32.5%)
Do not know	20 (10%)
Adding statin therapy to patients with diabetes above the age of 40 years	
Yes	153 (76.5%)
No	26 (13%)
Do not know	21 (10.5%)
knowing the meaning of diabetic clinical therapeutic inertia	
Yes	96 (48%)
No	104 (52%)
If the oral therapy does not achieve target levels, how long does it take to start insulin therapy?	
< 3 months	133 (66.5%)
3-6 months	56 (28%)
6 months – 1 year	10 (5%)
1-2 years	1 (0.5)
Before insulin initiation, how many times do you confirm HbA1c level?	
Once	105 (52.5%)
Twice	81 (40.5%)
Three times	13 (6.5%)
More than three times	1 (0.5)
Which upper limit of fasting blood glucose do you use as good control target in treated T2DM patients?	
100 mg/dl	9 (4.5%)
120 mg/dl	38 (19%)
130 mg/dl	146 (73%)
140 mg/dl	7 (3.5%)

HbA1c: Glycated haemoglobin.

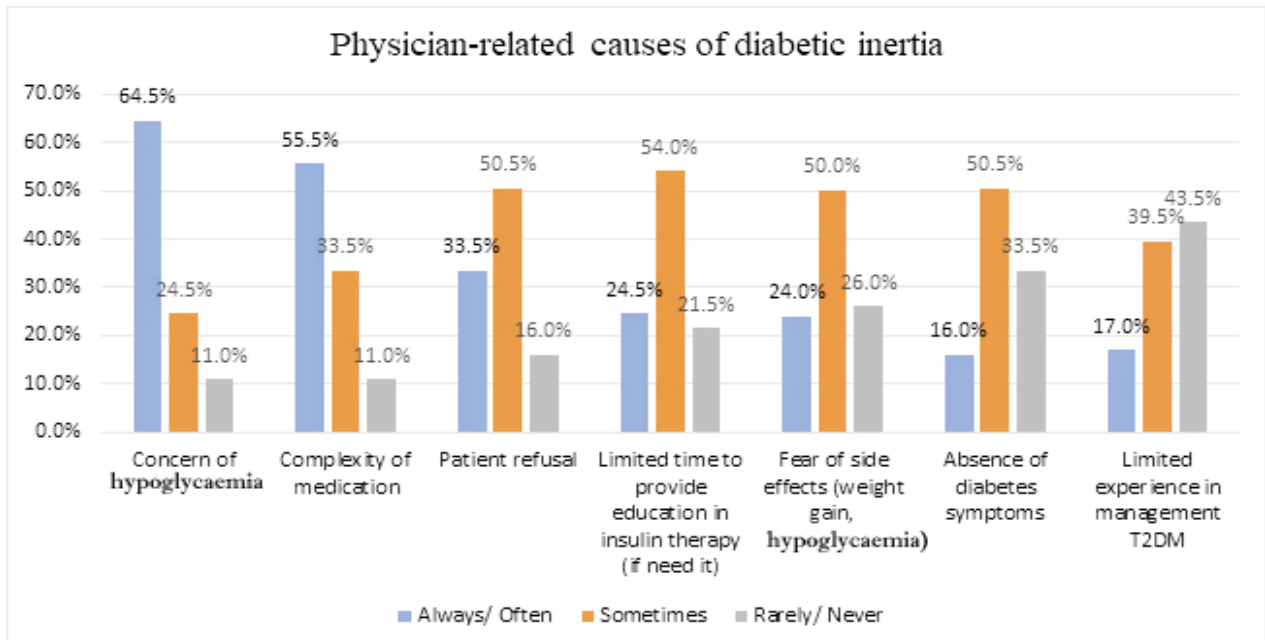


Figure-1: Physician-related causes of diabetic therapeutic inertia. T2DM: Type 2 diabetes mellitus.

healthcare providers 105(52.5%) depended on one HbA1c level, 81(40.5%) depended on two levels, and 13(6.5%) depended on three levels before initiating insulin therapy. Additionally, 146(73%) healthcare providers agreed that the optimum fasting blood glucose (FBG) level target for T2DM was <130mg/dL.

Physician-related factors behind diabetic TI included concern about hypoglycaemia 130(65%), followed by the complexity of medication, patient refusal, limited time to provide education about insulin therapy, fear of side effects, and the absence of diabetes symptoms (Figure 1).

Patient-related factors contributing to diabetic TI, from the PCPs' perspective, included resistance to lifestyle measures 47 (23.5%), followed by non-adherence to doctors' advice, failure or infrequent attendance of clinic appointments, limited understanding of T2DM seriousness, conflicting priorities such as work commitments, perceptions about insulin treatment, fear of injection pain, patient comorbidities, polypharmacy, the nature and complexity of the condition itself, communication barriers between doctor and patient, and the fear of weight-gain (Figure 2).

Regarding system-level factors contributing to diabetic TI, 107(53.5%) participants reported time constraints that affected the medication adjustment plan, 104(52%) mentioned workload pressures that influenced adjustments, 129(64.5%) indicated insufficient updated activities for staff, 96(48%) highlighted limited resources

affecting the medication plan, and 137(68.5%) noted that the absence of a multidisciplinary team involved in patient care was a contributing factor (Figure 3).

Among the participants, 50(52.6%) of the males and 46(43.8%) of the females knew the meaning of diabetic therapeutic inertia ($p=0.212$). Participants' professional degree significantly affected their knowledge ($p=0.003$). The highest percentage of knowledge was observed among consultants, followed by specialists and GPs. Consultants and specialists scored significantly higher than GPs ($p<0.001$). (Table 3).

Table-3: Factors affecting the knowledge of physicians about the meaning of diabetic clinical therapeutic inertia.

Do you know the meaning of diabetic clinical (therapeutic inertia)	Yes		No		p Value
	N	%	N	%	
	N	%	N	%	
Gender					0.212
Male	50	52.6	45	47.4	
Female	46	43.8	59	56.2	
Specialty					0.003
Family medicine consultant	40	64.5	22	35.5	
Family medicine specialist	19	46.3	22	53.7	
General practitioner	32	35.6	58	64.4	
Other	5	71.4	2	28.6	
Taking responsibility for the management of type 2 diabetes mellitus patients at your centre					0.608
Yes	95	48.2	102	51.8	
No	1	33.3	2	66.7	

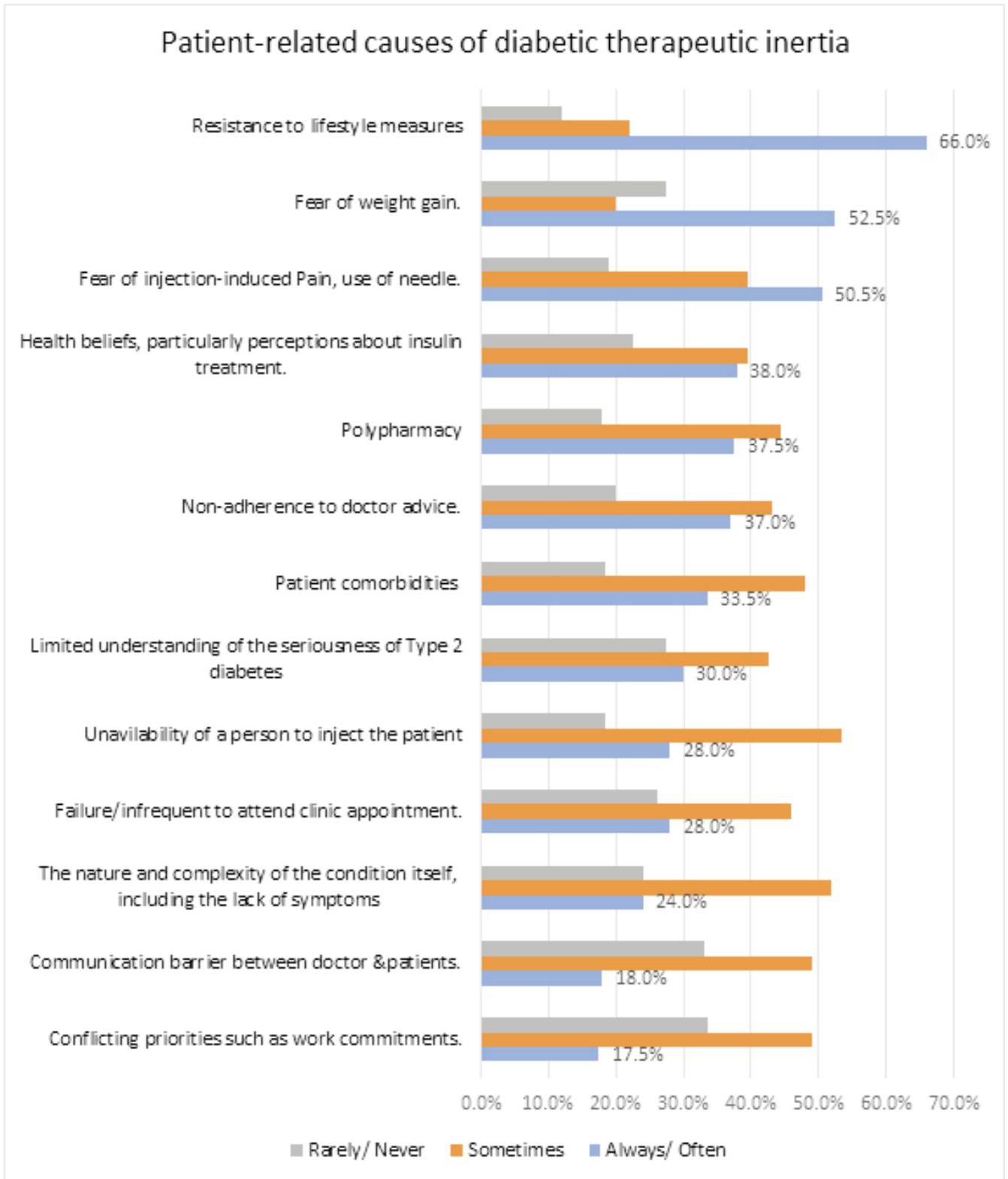


Figure-2: Patient-related factors of diabetic therapeutic inertia.

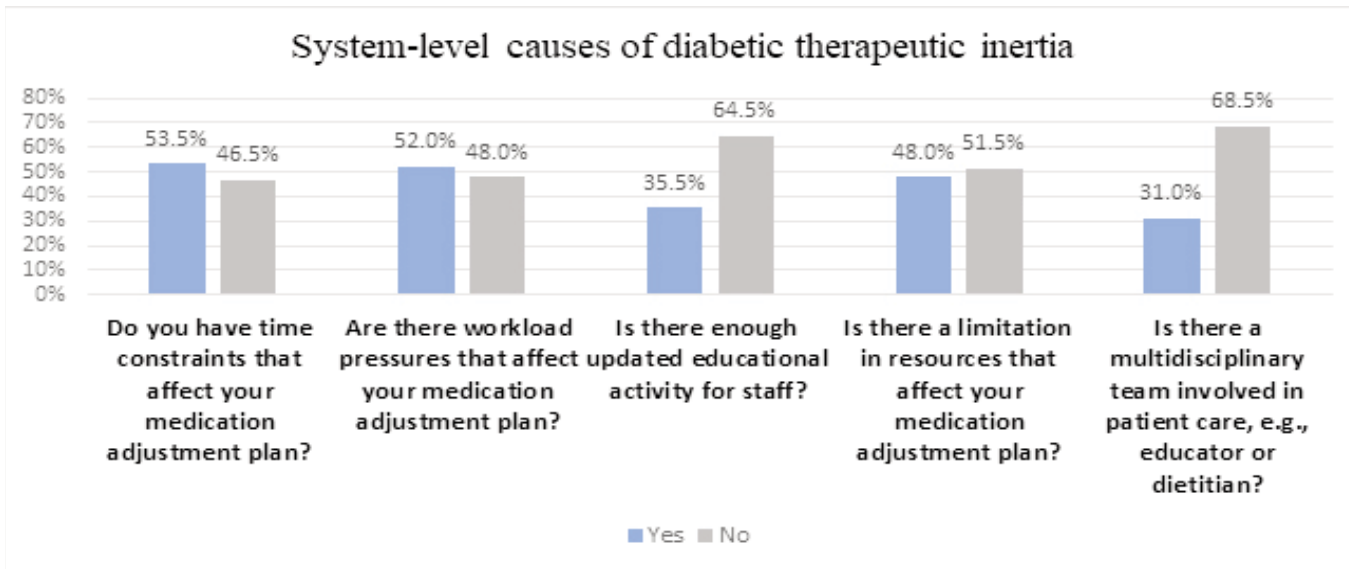


Figure-3: System-level causes of diabetic therapeutic inertia.

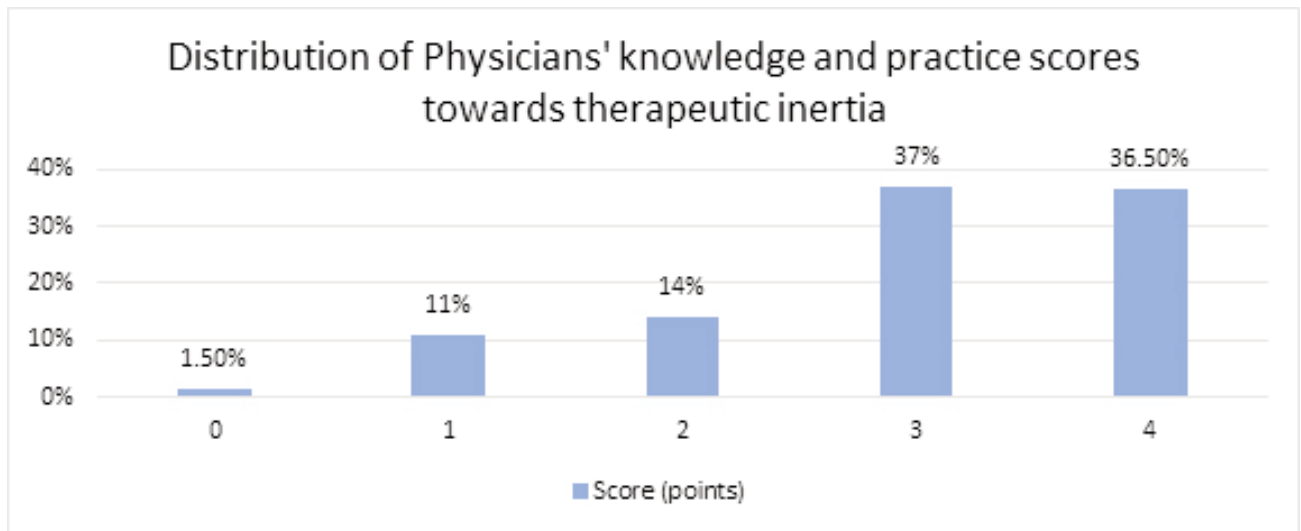


Figure-4: Distribution of knowledge and practice scores toward therapeutic inertia.

Table-4: Knowledge and practice score of physicians related to therapeutic inertia

Score	Count	Per cent
0	3	1.5
1	22	11.0
2	28	14.0
3	74	37.0
4	73	36.5
Median (IQR)	3.0 (2)	
Mean± SD	2.96± 1.04	

IQR: Interquartile range, SD: Standard deviation.

A total of 147(73.5%) participants scored 3-4 points, 28(14%) scored 2 points, 22(11%) scored 1 point, and 3(1.5%) scored zero on the knowledge and practice scale. The median score was 3(IQR: 2), and the mean score was 2.96+/-1.04 (Table 4, Figure 4).

A significantly higher score distribution was observed among the participants who were taking responsibility for managing T2DM patients at their centres (p=0.004). Gender (p=0.779) and awareness of therapeutic inertia (p=0.255) did not have a significant effect on the knowledge and practice scores (Table 5).

Table-5: Knowledge and practice scores across subgroups.

Factors	Count	Median	IQR	P-value
Gender*				0.779
Male	95	3	1	
Female	105	3	2	
Specialty**				<0.001
Family medicine consultant	62	3	1	
Family medicine specialist	41	3	1	
General practitioner	90	3	1	
Other	7	2	2	
Taking responsibility for the management of type 2 diabetes mellitus patients at your center*				0.004
Yes	197	3	2	
No	3	1	-	
Do you know the meaning of diabetic clinical (therapeutic inertia)?*				0.255
Yes	96	3	2	
No	104	3	1	

*Independent samples Mann-Whitney U test

**Independent samples Kruskal-Wallis test

IQR: Interquartile range

Discussion

PCPs in Saudi Arabia were the subject of the current study. The main goal was to address physician resistance to insulin therapy in order to begin overcoming this resistance, enhance the standard of care, and lessen the burden of complications associated with T2DM. Most PCPs in the current study felt comfortable starting an insulin regimen, and most of them regularly prescribed insulin. The majority of T2DM patients are treated at primary care facilities, and Saudi Arabia has already started shifting focus and funding away from secondary and tertiary healthcare facilities towards primary healthcare. The high rate of confidence and experience with insulin therapy among the PCPs may be explained by this shifting strategy, which also includes the mandatory continuing medical education (CME) for all healthcare professionals, as well as the popularity and simple accessibility of educational materials and online courses on diabetes management.

According to a recent systematic review, the median time to treatment intensification following at least one HbA1c measurement above the target ranged from 0.3 to 7.0 years, and the median time of management intensification was >1 year.¹² Surprisingly, some of the included studies showed that the time for intensification was up to 7 years (Range: 0.3-7.2 years). TI increased with the increase in the number of drugs used, and decreased with the increase in HA1c levels.¹²

Overtreatment or delay in de-intensifying diabetes management, especially among older people who are at increased risk of hypoglycaemia and polypharmacy-related side effects, is also considered TI.¹²

The majority of the PCPs in the current study had at least five years of experience in primary healthcare, and were seeing at least 10 diabetic patients every week. A significant of the PCPs reported prescribing insulin. Also, free insulin was available to every doctor, and all of them had access to insulin pens. The current PCPs were practising in areas where diabetes is common.

There is broad agreement that preventing long-term complications and improving QOL are the ultimate aims of diabetes management, and these goals can only be met by maintaining glycaemic control over time. Unfortunately, this is a difficult undertaking because diabetes is a progressing condition that necessitates prompt treatment optimisation, which in the majority of instances entails insulin therapy.¹³ Yet, in some clinical settings, the administration of insulin is frequently postponed, and by the time it is started, irreversible problems may already be evident. This delay is multifaceted, and frequently a doctor decides to delay insulin therapy rather than the patient.

Depending on the degree of hyperglycaemia or HbA1c levels, the majority of PCPs in the current study (88.9%) concurred that insulin therapy should be started, especially if the patient was taking the maximal dosage of oral anti-hyperglycaemic drugs and had an HbA1c >7%. This agreement was in keeping with the recommendations of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD), which state that patients on dual or triple therapy who have HbA1c levels beyond their personal targets, as well as those who have extremely symptomatic hyperglycaemia or HbA1c levels >10, should begin insulin therapy.^{14,15} Also, the current study's doctors were reluctant to start insulin therapy primarily because of system-related and patient-related concerns rather than physician-related ones. According to the physicians, the primary causes of reluctance were non-adherence to self-monitoring of blood glucose (SMBG), non-adherence to appointments or treatments, elderly patients with a high risk of hypoglycaemia, patient rejection, and a lack of staff education. Lack of recent training or experience, a lack of time for patient education, low socioeconomic status, excess body weight, and the presence of CVDs were the minor problems mentioned by the PCPs.

The perceived obstacles to starting insulin therapy in the current study were similar to the findings of other studies conducted in Saudi Arabia.¹⁶ Needle usage, anxiety about hypoglycaemia, weight-gain, a challenging administration technique, and social stigma or humiliation were the most frequent barriers to taking

insulin among Saudi T2DM patients.¹⁷

Additional obstacles mentioned by the current PCPs were similarly mentioned in comparable surveys on T2DM patients in Saudi Arabia, including worries about QOL impairment, concern about job instability, and anxiety about gaining weight.¹⁸

Patients and doctors alike take the incidence of hypoglycaemia with any diabetic therapy very seriously. Most of the PCPs (73.6%) in the current study stated that they were hesitant to start insulin therapy for patients who did not comply with their medication, were unable to conduct SMBG, or were at high risk of hypoglycaemia. They also thought that most of their patients might refuse insulin, and almost half (46.5%) of the PCPs admitted to delaying insulin owing to personal concerns about hypoglycaemia.

The concern of hypoglycaemia is a prevalent theme across studies conducted in Saudi Arabia and internationally. But, according to the other studies, physicians in countries other than Saudi Arabia, are less concerned about hypoglycaemia.^{19,20} In a global survey of 1,250 physicians, including 150 from the United Kingdom, 75.5% reported that they would intensify treatment more readily if it were not for concerns about hypoglycaemia.²¹ Recent studies support the approach of combining various glucose-lowering agents right from the initial T2DM diagnosis.²²

Studies on the prevalence of hypoglycaemia among Saudi diabetes patients are scarce. According to one study, 12.5% of T2DM cases were mostly due to missing or delaying meals after receiving an insulin injection. A higher rate of hypoglycaemia was reported during the day-long fasting month of Ramadan.^{23,24} These findings have important clinical ramifications because they lead doctors to delay starting insulin therapy, which leads to greater issues associated with diabetes. Doctors should be aware of the signs and symptoms of hypoglycaemia as well as the risk factors that can cause it.^{23,24}

The expertise, education, and experience of the doctors play a significant role in how they make decisions, particularly when it comes to the commencement and intensification of insulin therapy. Only 14.6% of the current PCPs reported that they lacked the confidence to start insulin therapy. Insufficient education, expertise and knowledge (17%), as well as a lack of current information (25.7%), were acknowledged as obstacles to starting insulin therapy by the PCPs. Surveys conducted in various parts of Saudi Arabia revealed that PCPs had higher levels of poor confidence, less experience, and inadequate

knowledge. Studies from other countries have exposed shortcomings in physician education, and suggested specialised medical education programmes to enhance doctors' understanding of, attitudes towards, and beliefs regarding insulin.²⁵

In medical literature, the prevalence of TI in any situation has not been extensively studied. However, between 2000 and 2005, in a multispecialty group practice in the United States, 27% patients experienced periods of chronic hyperglycaemia, which are indicated by two consecutive HbA1c levels >8% with no intervening medication intensification.²⁶ In another American study²⁷, the management of diabetics from a disadvantaged community was compared between a primary care setting overseen by general internal medicine faculty, and the diabetes clinic, a specialty setting overseen by endocrinologists. In the primary care setting, medication utilisation, including the use of insulin, was less intensive. Regardless of the type of therapy taken into consideration, therapy was less than half as likely to be increased in the main care centre compared to the diabetes clinic even when patients had elevated glucose levels in the clinic ($p=0.0001$). In the primary care centre, the HbA1c averaged 8.6% compared to 7.7% in the diabetes clinic ($p=0.0001$). Hence, the problem of TI is less frequent the more specialised the clinical team is.¹⁹

According to a study on T2DM consultations in primary care, for patients with HbA1c levels >7%, each extra patient concern was linked to a 49% lower likelihood of medication modifications, regardless of the level of HbA1c or the time of the consultation.²³

Nothing is known about the connection between the prices of diabetes medications and TI. Prescription budgets typically have an impact on regimen selection. Regardless of the cost, patients should ideally obtain an anti-diabetic treatment regimen that is consistent with rapid and safe blood glucose correction.

Recent studies conducted in Australia have shown that a novel integrated primary-secondary model of care for individuals with complex T2DM may result in fewer admissions for a diabetes-related complication and lower costs for care than those receiving standard care. The employment of well-trained, well-organised primary care teams that provide enhanced diabetic care has the potential to have longer-lasting advantages.²⁸

The current study has limitations because of a relatively small sample size compared to the total number of PCPs in Madinah, which may have limited the generalisability of the findings. Additionally, data collection via online

surveys may have excluded some physicians who might have been less familiar with technology or unable to complete online questionnaires.

Conclusion

The importance of healthcare organisations supporting PCPs with focussed initiatives on diabetes management was significant. By addressing the factors contributing to TI, such as system limitations, patient-related barriers and physician concerns, healthcare providers can reduce delays in insulin initiation, and improve patient outcomes.

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AUTHOR'S CONTRIBUTION:

AMQS: Concept, idea, literature search and provide logistic support.

AAS: Enriching references and writing the study discussion.

MAB: Appropriate method of analysis and interpreted the results of study.

MAH: Collected and organised data.

MAT: Enriched introduction and literature search.

All authors have critically reviewed and approved final draft.