## RESEARCH





# Patient-centered care and satisfaction of patients with diabetes: insights from a survey among patients at primary healthcare centers in Saudi Arabia

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## Abstract

**Background and objective** Patient-centered care (PCC) and patient satisfaction are pivotal in healthcare provision for patients with diabetes. This study investigates the link between perceived PCC and satisfaction with care among patients with diabetes in Saudi Arabia.

**Methods** A cross-sectional study was conducted at 47 primary healthcare centers affiliated with general hospitals, including King Abdullah Medical Complex, King Abdulaziz Hospital, East Jeddah Hospital, King Fahd General Hospital, and Al Thagr General Hospital, operated by the Ministry of Health in Jeddah City, Saudi Arabia, between July and August 2023. Over 800 patients with diabetes were approached through a random sampling technique at the reception areas of these centers. These patients were directed to designated private rooms for further engagement, where they completed a face-to-face questionnaire administered by an interviewer. Data analysis was conducted using the software package SPSS version 28 and AMOS version 28.

**Results** Of the 594 patients who participated in the study (response rate 73.4%), the results indicated that the perceived level of PCC, including physical comfort ( $\beta = 0.200$ , p = 0.000), continuity in care transition ( $\beta = 0.114$ , p = 0.031), access to care ( $\beta = 0.203$ , p = 0.000), information and education ( $\beta = 0.169$ , p = 0.001), and family and friends involvement ( $\beta = 0.082$ , p = 0.023), were significantly related to patient satisfaction. However, other perceived PCC components, like patient preferences ( $\beta = 0.052$ , p = 0.233), care coordination ( $\beta = 0.078$ , p = 0.123), and emotional support ( $\beta = -0.080$ , p = 0.066), did not appear to have a significant relationship with patient satisfaction. Income and level of education substantially impacted the perception of PCC and satisfaction with care. One notable finding was that the perceived level of PCC had a strong positive relationship with patient satisfaction ( $\beta = 0.762$ , p = 0.002).

**Conclusion** This study highlights the significant positive relationship between PCC and patient satisfaction in diabetes care in Saudi Arabia. It emphasizes the need for healthcare tailored to individual needs and demographic factors. This provide advocates the broader integration of PCC principles in health systems, particularly in Saudi Arabia,

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to improve patient experience and satisfaction. Policymakers should integrate patient-centered care into healthcare policies to improve service quality and health outcomes.

Keywords Patient-centered care, Patient satisfaction, Diabetes care, Primary healthcare, Saudi Arabia

## Introduction

Diabetes is a chronic condition affecting millions worldwide [1, 2]. Diabetes mellitus requires continuous and comprehensive medical care and a variety of strategies for its management [3]. Over the past few decades, the prevalence of diabetes has increased steadily, resulting in approximately 422 million people globally having diabetes [4]. The prevalence is projected to double by 46%, reaching 783.2 million by 2045 from its current level [5, 6]. Data from the World Health Organization (WHO) indicate that the Kingdom of Saudi Arabia (KSA) ranks second in the Middle East for the prevalence of diabetes and seventh worldwide. Based on recent statistics, in 2016, 15.8% of the adult population in Saudi Arabia had diabetes, growing to 17% by 2020. According to projections, by 2026, 24.3% of the adult population will be diabetic [7]. During the past three decades, the prevalence of diabetes has increased by a factor of ten in Saudi Arabia [8], highlighting a significant public health challenge. Healthcare organizations across the country recognize the need to pivot their strategies toward a model of care that revolves around the patient. Empirical evidence of clinical outcomes and patient satisfaction and compelling evidence advocating for adopting patient-centered care support this recognition [9].

At its core, PCC is an approach where healthcare decisions and quality measures revolve around the patient's health needs and desired outcomes. The global shift towards PCC has prompted the Saudi government to propose transformational goals as part of its Vision 2030. These goals are to enhance the healthcare quality of services delivered, leading to better patient experiences and improved patient outcomes. Many countries, including Saudi Arabia, aspire to adopt a value-based model, emphasizing patient-centered care and outcomes. To achieve this, a broad transformation is underway to reshape traditional health systems, like the system in Saudi Arabia, into a more patient-centered and valuedriven system [10]. PCC in diabetes care requires that healthcare providers collaborate with patients to create individualized care plans. This collaboration includes setting realistic goals, developing strategies to achieve those goals, and regularly assessing progress. Actively involving patients in the decision-making process requires insight into their lifestyle, preferences, and barriers they may face, which can help tailor treatment plans that are more likely to be successful. The absence of PCC is linked to poor healthcare quality, like missed appointments and decreased treatment compliance [11]. Patient feedback ensures that diabetes care plans are medically sound and practical. In this way, patients become more engaged in their health improvement and are more aware of how their conditions are managed, resulting in more consistent and effective outcomes.

The Harvard School of Medicine and the Picker Institute have identified eight fundamental dimensions of PCC that serve as the cornerstones to enhance patient experiences and satisfaction levels. The common core principles of PCC are respect for patient preferences, coordination of care, emotional support, physical comfort, information and education, continuity and transition, the involvement of family and friends, and access to care [12], and it has been used in several studies [9, 13]. In recent years, the patient's perspective has emerged as a key metric for evaluating healthcare quality [14]. Despite being criticized for subjectivity, patient satisfaction has become a critical indicator of enhancing performance and clinical effectiveness [15]. Patient satisfaction is a determinant of perceived medical care quality and a key objective of healthcare providers. A patient's relationship with the healthcare provider and their satisfaction with this provider is essential to follow up and manage the patient's disease [2]. Additionally, when patients are satisfied with their healthcare provider, they are more likely to comply with treatment plans, adhere to medications, and actively engage in preventive measures, contributing to improved health outcomes. Patient satisfaction also contributes to healthcare providers' positive reputation and can help attract new patients, fostering a thriving healthcare practice.

Various studies have sought to identify the advantages of implementing the PCC model in healthcare, indicating that perceptions of PCC indirectly facilitate improved diabetes outcomes [16, 17]. This relationship has been observed in adults with type 2 diabetes [18] as well as in adolescents with type 1 diabetes [19]. One study showed that the utilization of PCC was significantly correlated with satisfaction among individuals diagnosed with type 2 diabetes, as observed during their follow-up visit within a span of 10 months after their initial consultation [20]. Other studies have reported a significant relationship between PCC and lower mortality, emergency return visits, and medication errors [21]. The available evidence supports the positive impact of PCC on health outcomes [17, 22]. A recent study found that patient-centered care and diabetes education significantly optimize glycemic control and cardiovascular risk management for diabetics [22]. Moreover, other studies suggest that PCC improves efficiency, resulting in fewer diagnostic tests and unnecessary referrals [23].

A wide range of previous studies have examined PCC in the context of chronic disease and multimorbidity, emphasizing key domains such as clinician-patient relationships, mental health support, and equitable access to healthcare [24-26]. While the PCC approach has been widely adopted across different healthcare settings worldwide, a significant gap and limited understanding exists in the Middle East [27], which remains relatively new to some health organizations in Saudi Arabia, where PCC has been measured from a patient's perspective [11, 28, 29]. Based on this global understanding, therefore, this study aims to close this gap, contributing novel insights to the regional understanding of PCC. Using the Picker Institute's eight-dimensional PCC framework [12], we aimed to investigate the link between the perceived level of PCC and satisfaction with care among patients with diabetes in Saudi Arabia. A further contribution of this study is examining the role of demographic and health data as a controlling for PCC and patient satisfaction with care received at primary healthcare centers in Saudi Arabia. Subsequently, the researchers constructed the model based on grounded insights from an extensive literature review [11] (see Fig. 1).

## Method

## Study design

This cross-sectional study was based on a face-to-face interviewer-administered questionnaire using a standardized questionnaire among patients with diabetes attending primary healthcare centers between July and August 2023. The study included all 47 primary healthcare centers affiliated with general hospitals, including King Abdullah Medical Complex, King Abdulaziz Hospital, East Jeddah Hospital, King Fahd General Hospital, and Al Thagr General Hospital, operated under the Ministry of Health in the city of Jeddah, Saudi Arabia.

## Sampling

The research aimed to collect data from a diverse and sufficiently large sample, as a larger sample size enhances external validity and generalizability [30]. According to the latest KSA census, the total population of Saudi Arabia is 32,175,224 [31]. Slovene's formula was used to calculate the sample size,  $n = N / (1 + N e^2)$ , where N is the total population size, and e is the acceptable margin of error of ±5%. This formula initially yielded an estimated sample size of 384 would be needed. To achieve the research objective and account for anticipated nonresponses and missing data, as well as to enable subgroup analyses while maintaining methodological rigor, we invited over 800 participants to ensure a robust and representative final sample. This decision was made strategically to mitigate potential data loss and facilitate meaningful subgroup comparisons without compromising statistical power [32]. This provided ensured a wellbalanced, resource-efficient, and methodologically sound sample size, strengthening the reliability and depth of our findings [33].

This study targeted patients diagnosed with diabetes who were 18 or older. Patients were required to attend one of the primary healthcare centers during the study period and demonstrate a willingness to participate in face-to-face, interviewer-administered questionnaires. We excluded patients with critical illnesses due to the possibility that their health condition could impair their ability to participate meaningfully in the interviews.



Moreover, patients with cognitive impairments, communication difficulties, or language barriers were excluded from the survey.

## Data collection instrument

A questionnaire was designed to collect information from the study participants. The questionnaire included several sections covering socio-demographic characteristics, PCC, and patient satisfaction.

The socio-demographic section included general individual and household characteristics and health-related individual characteristics reported as relevant in previous research on patients with diabetes [34, 35].

The Patient-Centered Primary Care Instrument (PCC-36), a validated and widely used tool [36], was utilized in this study to assess PCC dimensions. This PCC tool is considered one of the most influential and frequently used models in the United States for promoting PCC [37]. Various studies have demonstrated the benefits of the PCC tool [38-40]. In this study, we used the tool to assess the perceived PCC, specifically among patients with diabetes in primary care centers. The PCC tool included questions about respect for patient preferences, care coordination, emotional support, physical comfort, information and education, continuity and transition, the involvement of family and friends, and access to care. The PCC-36 instrument was initially developed to measure patient-centered care among patients with multimorbidity. We modified this instrument to specifically assess patient-centered care, emphasizing satisfaction with care among patients with diabetes in the primary care setting. Modifications were minor and had no significant impact on the original structure of the instrument. The PCC-36 enabled a comprehensive assessment of PCC by quantifying patient perceptions using a Likert scale, with 1 = "Very Poor," 2 = "Poor," 3 Neutral", 4 = "Good," and 5 = "Very Good." This scale is intended to reflect the full spectrum of respondents' feelings or perceptions of the evaluated items.

The patient satisfaction section was also based on a set of questions used in similar studies [41, 42]. It has been carefully adapted and validated to ensure comprehensiveness and appropriateness for this study. We included questions on patients' satisfaction with their ability to access diabetes clinic services. This indicator measures whether patients find these services easy to access and convenient. Additionally, they evaluate satisfaction with the continuity and transition of care provided by the diabetes clinics, focusing on their seamlessness and consistency. Further, the questionnaire measures satisfaction with the behavior of clinic staff in terms of professionalism, friendliness, and helpfulness. Finally, the section included a question regarding a patient's overall satisfaction with the services provided by the diabetes clinic. This provides a general evaluation of the patient's satisfaction with the clinic's services. Likert scales were used to assess items, where 1 = "Very Unsatisfied," 2 = "Unsatisfied," 3 = "Neutral," 4 ="Satisfied," and 5 = "Very Satisfied." This scale is intended to reflect their level of satisfaction with the specific aspects being measured.

Based on WHO guidelines, a back-forward translation technique was used to prepare the questionnaire for the data collection [43]. The questionnaire was originally developed in English. N.A. translated the questions into Arabic, and two certified translators translated them back to English to ensure the accuracy and preservation of the meaning captured in the original English version. Experts reviewed the questionnaire to assess its content validity. Specifically, academic experts from King Abdul-Aziz University and physicians from the Ministry of Health were requested to evaluate the content validity of the questionnaire. The experts reviewed both the English and Arabic versions of the questionnaire. Any discrepancies or inaccuracies in the translation were identified and addressed by comparing the back-translated version with the original.

The translated questionnaire's face validity was evaluated using a purposive pilot sample with 20 patients from the target population, which ensured a diverse representation across ages, education levels, and genders. Validity was confirmed through face-to-face discussions, and the Arabic questionnaire was prepared for administration using the Qualtrics software package.

## **Data collection**

The Key Performance Indicator Company collected the data. The company involved a dedicated research team of 11 skilled research assistants and two authors, N.A. and A.A.A. Before data collection, N.A. and A.A.A. provided comprehensive training to ensure the research assistants were well-prepared for their tasks. At the end of each day, the entire team convened to discuss and resolve any difficult issues encountered, fostering a collaborative environment that promotes effective problem-solving and ensures better quality of the collected data. A random sampling technique was used to ensure fairness and representativeness across all participating healthcare centers. At each healthcare center, patients were approached as they arrived at the reception desk. The research team explained the purpose of the study to the patients and invited them to participate. Once patients expressed an interest and met the inclusion criteria, they were directed to a designated private room within the healthcare center for further engagement and data collection. Either the authors themselves or one of the research assistants conducted the questionnaire. Before proceeding with the questionnaire, all respondents provided informed consent after receiving a detailed explanation of the

study's purpose, procedures, and ethical considerations. Subsequently, the researchers or assistants filled out the respondents' answers.

## Data analysis

Descriptive analysis, including mean, median, and SD, was applied to describe continuous variables, and frequencies and percentages were used to describe categorical variables. Additionally, we used Cronbach's alpha to assess the reliability of the PCC and patient satisfaction scales, ensuring that composite PCC and patient satisfaction scores consistently measured the same underlying constructs. Higher values of Cronbach's alpha, ranging from 0.77 to 0.89, indicate strong reliability, according to Taber [44]. This affirmed the scales' robustness for further analysis, which was conducted in four stages.

In the first stage, composite scores were estimated for PCC and patient satisfaction based on the questions in the respective tool. Specifically, we averaged these metrics to simplify the data and enhance interpretability for multiple regression analysis. The regression analysis aimed to explore the relationship between the dependent variable patient satisfaction composite score and independent PCC composite scores per PCC domain without including the influence of external demographic factors. (See Fig. 1; Table 1).

The second stage involved performing independent samples t-tests (gender, nationality, family history with diabetes, and having children) and ANOVA test to examine the variation in PCC domains and patient satisfaction composite scores across socio-demographic variables (such as monthly income, educational level, age, living area, marital status, smoking, body mass index, and type of diabetes). This analysis was conducted to determine whether there were any significant associations between these socio-demographic factors and domains of PCC and patient satisfaction.

The third stage conducted an Exploratory Factor Analysis (EFA) using the Maximum Likelihood method to examine the structure of the Patient Satisfaction items. The Kaiser-Meyer-Olkin (KMO) value was 0.752, and Bartlett's test of sphericity was significant (p < 0.001), confirming the data's suitability for factor analysis. Also, a Confirmatory Factor Analysis (CFA) was conducted to evaluate construct validity, with factor loadings ranging from 0.33 to 0.79 for the four items. Convergent validity was demonstrated through an Average Variance Extracted (AVE) value of 0.57, while the internal consistency of the questionnaire was supported by a Cronbach's alpha of 0.823. Face validity was established through expert review to confirm the clarity, relevance, and appropriateness of the items.

A structural equation model (SEM) was used in the final stage to investigate the variables' interrelationships and assess the moderating factors' influence. Based on Schreiber [45], SEM was chosen because it allows multiple independent relationships to be examined simultaneously, providing a comprehensive view of how variables are interconnected. In addition, it offers the opportunity to assess direct and indirect demographic effects, which is crucial for understanding the underlying patterns and relationships. The SEM model assumes a relationship between latent variables (in this study, the PCC and patient satisfaction domains) and observed variables (i.e., responses to the PCC and patient satisfaction questions). These latent variables generally appear in a linear combination or assist as intervening moderating variables. All latent variables and measured indicators were implemented according to the study model (see Fig. 1). The SEM allowed the estimation of coefficients between variables and their related indicators coefficients, including factor loadings, regression weights of path analysis, and correlations between latent variables.

The SEM was validated through factor loadings exceeding 0.5, confirming the validity of the results based on Hair et al. [46]. CFA was used to check validity and reliability and ensure that measured indicators are well represented by their latent variables. The values of factor loadings were used as indicators for the validity of SEM. We calculated factor estimates. The item loadings

**Table 1** Linear multiple regression analysis of patient satisfaction (N = 594)

Independent Variable	Dependent Variable: Patient satisfaction						
	Unstandardized Coefficients		Standardized Coefficients		p		
	В	Std. Error	B	t			
Patient-centered care <sup>a</sup>	0.225	0.073		3.104	0.002		
Patient preferences	0.052	0.044	0.056	1.194	0.233		
Physical comfort	0.200	0.047	0.193	4.267	0.000		
Coordination of care	0.078	0.051	0.089	1.544	0.123		
Continuity and transition	0.114	0.053	0.117	2.163	0.031		
Emotional support	-0.080	0.043	-0.100	-1.844	0.066		
Access to care	0.203	0.040	0.219	5.024	0.000		
Information and education	0.169	0.050	0.167	3.355	0.001		
Family and friends	0.082	0.036	0.089	2.280	0.023		

of almost all items exceeded the effective cut-off value of 0.70%. Following Cronbach's alpha [47], this test is intended to assess the variables' internal consistency and reliability. The Average Variance Extracted (AVE) estimate should be greater than 0.70. Based on the convergent validity criteria, AVE estimates should be greater than 0.50 [48]. In this study, all of the AVEs exceeded 0.50. As a result, the data demonstrated satisfactory reliability and convergence validity. Furthermore, the strength and stability of the constructs within our SEM framework further confirm the validity of our results.

To assess the fit of our model, we used the Comparative Fit Index (CFI), CMIN/DF (Chi-square/degrees of freedom), and Root Mean Square Error of Approximation (RMSEA). The CFI value exceeded the recommended threshold of 0.90, the CMIN/DF value was below the recommended threshold of 3, and the RMSEA value was below the recommended threshold of 0.08 [45], indicating a good level of model fit. Data analysis was conducted using the software package SPSS version 28 and AMOS version 28.

#### Results

Over 809 respondents were initially invited to participate in the study. However, only 594 patients completed the entire questionnaire, resulting in a response rate of (73.4%). The remaining 215 respondents (26.6%) did not complete the questionnaire due to various reasons, including 125 patients who had clinic appointments and were unable to complete the survey, 30 patients who expressed a desire to withdraw from the study without providing a reason, and 60 patients who cited a shortage of time as the main barrier to participation.

The results of the demographic information analysis showed that males and females represented (49.3%) and (50.7%) of the respondents, respectively, and that most respondents were between the ages of 41 and 60 years (254 respondents), constituting (42.8%) of all respondents with secondary education (43.3%). Most respondents were married (68%), had children (78.3%), were unemployed (45.3%), and had low monthly income (60.9%). Furthermore, of the total respondents, 507 (85.4%) were Saudis. The data indicated that many patients did not smoke (72.6%) and had been diagnosed with diabetes during the past 15 years (44.4%). Moreover, most patients had a family history of diabetes (63.5%) and visited their physician every three months (53.9%). (47.8%) of patients had not followed the nutritional plan, and (35.9%) had not participated in any sports activity. In addition, (68.4%) had Type 2 diabetes, (44.4%) of the patients were overweight, using both insulin and medication (47.3%), and were in good health (93.4%). Appendix 1 provides a detailed description of these characteristics.

Table 2 displays the mean, and standard deviation of all PCC variables. The results indicate a high level of PCC, with high scores in patient preferences (M=4.11, SD=1.04), physical comfort (M=4.20, SD=0.98), coordination of care (M=3.92, SD=1.12), continuity and transition (M=4.09, SD=0.99), emotional support (M=3.86, SD=1.15), access to care (M=3.98, SD=1.14), information and education (M=4.25, SD=0.95), and involvement of family and friends (M=4.22, SD=0.97). The dimensions demonstrated strong reliability wherein Cronbach's alpha values are ranging from 0.78 to 0.90, and standard deviations (0.8 to 1.3). This in fact demonstrated reasonable response variability.

Table 3 presents the results concerning patient satisfaction with diabetes clinic services. The high Cronbach's alpha ( $\alpha = 0.84$ ) indicates strong reliability, and the overall mean satisfaction score of 4.25 (SD = 0.95) reflects positive patient experiences with high level of satisfaction. EFA identified a single factor explaining 67.0% of the variance, with all item loadings exceeding 0.40. CFA further supported construct validity, with factor loadings of 0.79, 0.67, 0.33, and 0.49 for the four items, respectively. AVE was 0.57, indicating an acceptable level of convergent validity. The internal consistency of the Patient Satisfaction questionnaire was strong, with a Cronbach's alpha of 0.823.

Table 1 presents the findings from a linear multiple regression analysis to identify predictors of overall perceived PCC. Results indicate that patient preferences did not exhibit a statistically significant relationship with patient satisfaction (p = 0.233). Conversely, physical comfort had a significant and positive association with patients' satisfaction (p = 0.000), as did continuity and transition (p = 0.031). However, coordination of care did not have a significant relationship with patients' satisfaction (p=0.133), and the same holds for emotional support (p = 0.066). On the other hand, information and education showed a significant positive relationship with patient satisfaction (p = 0.001), as did family and friends (p=0.023). Access to care also exhibited a significant positive relationship with patient satisfaction (p = 0.000). This model demonstrates a good fit, accounting for the variance in patient satisfaction. The model has several significant predictors with R<sup>2</sup>= 0.465 and Adjusted  $R^{2}$ Square = 0.458, indicating that the identified PCC factors effectively explain nearly half of the variance in patient satisfaction.

According to the t-test results, PCC and patient satisfaction showed no significant differences in nationality, gender, family history of diabetes, or having children. In addition, ANOVA tests show that various aspects of perceived PCC were significantly correlated with two demographic variables: monthly income and educational level. The other socio-demographic variables like age, living **Table 2** Descriptive statistics of perceived level of patient-centered care items (N = 594)

Patient-centered care dimension	Mean (SD)		
Response options: 1 = Very poor; 5 = Very good			
Patients' preferences; Cronbach's $\alpha = 0.90$			
1. I felt taken seriously	4.35(0.89)		
2. My wishes and preferences were taken into account when choosing a treatment	4.08(1.04)		
3. I was involved in decisions about my treatment	4.05(1.07)		
4. The influence that the treatment can have on my life was taken into account	3.7(1.33)		
5. I was helped to determine my own treatment goals	4.16(1.01)		
6. I felt supported to achieve my treatment goals	4.18(1.01)		
7. I received advice that I really could use	4.27(0.99)		
<b>Physical comfort;</b> Cronbach's α=0.83	4.20(0.98)		
1. Attention was given to my physical comfort (such as the management of pain, shortness of breath)	4.05(1.06)		
2. Attention was paid to fatigue and insomnia	4(1.12)		
3. The (waiting) rooms were clean	4.4(0.82)		
4. The (waiting) rooms were comfortable	4.19(1.04)		
5. In the treatment room(s) and at the counter there was sufficient privacy	4.4(0.86)		
<b>Coordination of care;</b> Cronbach's $\alpha = 0.80$	3.92(1.115)		
1. Everyone was well informed; I only had to tell my story once	4.14(1.04)		
2. The care was well attuned between the practitioners involved	4.14(0.98)		
3. I knew who was coordinating my care	3.93(1.13)		
4. I could easily contact someone with questions	3.47(1.31)		
<b>Continuity and transition;</b> Cronbach's $\alpha = 0.83$	4.0875(0.985)		
1. When being referred to another care provider (specialist /dietician/ physiotherapist) I was well informed about where to go and	3.86(1.11)		
why			
2. With a referral, all my information was passed on correctly	4.25(0.91)		
3. Advice (such as medication) from different practitioners (medical specialists and family doctor) was well attuned to each other	4.11(0.97)		
4. The treatment of the family doctor is in line with the treatment of other care providers	4.13(0.95)		
<b>Emotional support;</b> Cronbach's $\alpha = 0.87$	3.86(1.145)		
1. Emotional support was also provided	3.89(1.09)		
2. Attention was paid to possible feelings of fear, gloom and anxiety	3.95(1.09)		
3. I was made aware of the possibilities for more intensive emotional support	3.67(1.2)		
4. Attention was paid to the impact of my health on my private life (family, relatives, work, social life)	3.93(1.2)		
Access to care; Cronbach's $\alpha = 0.78$	3.976(1.136)		
1. It was no problem to go from my home to my family doctor and back again	4.14(1.11)		
2. The general practice was easily accessible	4.22(0.95)		
3. I could easily schedule an appointment quickly	3.96(1.21)		
4. On a visit I didn't have to wait long before it was my turn	3.52(1.32)		
5. I could easily request a repeat recipe	4.04(1.09)		
Information and education; Cronbach's $\alpha = 0.84$	4.25(0.9525)		
1. I was well informed	4.36(0.86)		
2. The information I received was well explained	4.28(0.95)		
3. I had easy access to my own data (lab results, medication overview, referrals)	3.91(1.2)		
4. I could ask all the questions I wanted	4.45(0.8)		
Family and friends; Cronbach's $\alpha = 0.85$	4.22 (0.97)		
1. With my consent, relatives were involved in my treatment	4.16(1.03)		
2. Attention was given to care and support provided by family members	4.32(0.91)		
3. Attention was given to possible questions from my family members	4.19(0.99)		

area, marital status, smoking, BMI, and type of diabetics did not appear to be significantly correlated with perceived PCC or patient satisfaction. Consequently, we only included income and education in the structural equation models. The results of the independent t-tests and ANOVA analyses can be found in the appendix. As shown in Fig. 2, we used SEM to represent relationships between variables. Perceived PCC is the independent variable, which includes various sub-variables such as patient preferences, physical comfort, coordination of care, emotional support, information and education, continuity and transition, access to care, and the involvement

Table 3	Descriptive	statistics of	patient	satisfaction (	N = 594
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Patient satisfaction; Cronbach's α=0.84 Response options: 1=Very unsatisfied; 5=very satisfied	Mean (SD) 4.25(0.95)
1. I am satisfied with accessing the diabetes clinic services	4.32(0.96)
2. I am satisfied with the continuity and transition in the diabetes clinic services	3.97(1.09)
3. I am satisfied with the behaviors of staff in the diabetes clinic services	4.38(0.88)
4. In general, I am satisfied with the diabetes clinic services	4.35(0.9)
a. Patient-centered care includes (PP, PC, CC, CT, ES, AC, IE, FF)	

b. R<sup>2</sup>= 0.465, Adjusted R<sup>2</sup>Square = 0.458

of family and friends. All these constructs are subdivided into 36 observable items, as shown in Table 2.

The results of the SEM show that perceived PCC has a strong positive effect on patient satisfaction ( $\beta$  = 0.726), underscoring the importance of patient-centered approaches in healthcare. Moreover, the results show that income significantly affects both perceived PCC ( $\beta$  = 0.201) and patient satisfaction ( $\beta$  = 0.095). Even though education significantly enhances perceived PCC

( $\beta$  = 0.172), it does not appear to affect PS (p = 0.402). The factor loadings for each item in our model constructs are shown in Table 4, providing evidence of the model's robustness and reliability. Perceived PCC is pivotal in patient satisfaction and other related healthcare constructs, as demonstrated by the robust factor loadings. The evaluation of goodness-of-fit measures indicates that all indices fall within acceptable limits and normal ranges (CFI = 0.936, GFI = 90, CMIN/DF = 2.42, RMSEA = 0.079). These findings suggest a good fitness for the proposed model.

## Discussion

This study explores the relationship between the perceived level of PCC (see above) and patient satisfaction among patients with diabetes in primary healthcare centers in Saudi Arabia. Also, examining the role of demographic and health data as a controlling for PCC and patient satisfaction. The model found that income significantly and positively impacted perceived PCC and patient satisfaction. Specifically, a higher income was associated



#### Fig. 2 Structural equation model

\*PCC: Patient-Centered Care, PP: Patient Preferences, PC: Physical Comfort, CT: Coordination of Care, ES: Emotional Support, AC: Access to Care, IE: Information and Education, FF: Family and Friends with higher levels of perceived PCC and greater patient satisfaction. Education also positively influenced perceived PCC and patient satisfaction, such that higher education levels led to higher levels of perceived PCC. The study's results show the significance of perceived PCC in enhancing patient satisfaction. Our analyses demonstrate that perceived PCC variables such as physical comfort, continuity and transition, information and education, access to care, and family and friends are positively associated with patient satisfaction. It was found that access to care had the strongest relation to patient satisfaction, while patient preferences, coordination of care, and emotional support did not significantly relate to patient satisfaction, suggesting that they may be less critical or require different approaches to influence patient satisfaction. After examining various demographic factors, the study found that income and education significantly influence perceived PCC and patient satisfaction.

Consistent with previous literature [2, 4], our results underscore the significance of PCC in enhancing patient satisfaction. This result aligns with previous studies, highlighting patient-centered care's role in improving patient satisfaction across different healthcare settings [9] and the WHO's emphasis on the need for comprehensive care for chronic diseases [4]. Our findings highlight the role of critical dimensions of PCC, namely physical comfort, continuity and transition, information and education, access to care, and family and friends, have a significant effect on patient satisfaction. These dimensions ensure that patients receive comprehensive and holistic care, improving health outcomes and increasing patient satisfaction. When patients feel physically comfortable and are provided with the necessary information and support, they are more likely to adhere to treatment plans and actively participate in their care. Furthermore, seamless continuity of care, along with the involvement of family and friends, further enhances patient satisfaction. These are particularly important in diabetes management, where the chronic nature of the disease requires ongoing, coordinated care. These results align with several studies that have well-documented the link between patient-centered care and enhanced clinical outcomes, as well as improved patient satisfaction [34, 35, 49-51].

While these PCC dimensions enhanced patient satisfaction, others, like patient preferences, care coordination, and emotional support, did not directly relate to patient satisfaction. This could be because patients may not always know the behind-the-scenes coordination efforts, leading them to undervalue this aspect. Emotional support and patient preferences might also be more subjective and vary widely between individuals, making measuring their impacts on overall satisfaction difficult. Therefore, these dimensions may not consistently translate into perceived improvements in patient satisfaction. Future studies should consider employing qualitative approaches to gain deeper insights into these subjective dimensions. When conducting interviews or focus groups, researchers can explore patient perspectives on coordination, emotional support, and preferences more thoroughly. This qualitative data can help identify patterns or themes that quantitative measures might overlook, leading to a more comprehensive understanding of Patient-Centered Care's impact on satisfaction.

The effect of demographic factors, especially gross income and education level, in the PCC and patient satisfaction relationship points to the influence of socioeconomic variables in this association. Income level and educational background might influence the degree of care and availability through other demographic factors. High income contributes to affordability and flexibility more in the health system, influencing desires and degree of satisfaction. Higher education improves health literacy and self-advocacy skills, resulting in a change in care experiences. Socioeconomic disparities have also been shown to impact the care-related health beliefs, behaviors, and stress levels of individuals through financial strain and challenges in navigating the health systems [52]. The results show that income and education levels significantly influenced PCC and patient satisfaction levels. However, age and gender were not associated with patient satisfaction and perceived PCC levels. Their consequences may be more complicated or situational rather than straightforward associations. This highlights the significance of tailored, socioeconomic, and equity-promoting PCC strategies in providing appropriate care and better population health [11, 28].

Our study has key implications for healthcare practice and policy, particularly in regions like Saudi Arabia. While initial moves have explored PCC uptake from patient perspectives within some settings, large-scale reforms orienting strategic priorities and operationalization more fully around evidence-based perceived PCC dimensions remain an ongoing imperative. While considering how socioeconomic diversity moderates experiences, tailoring care individually can enhance outcomes and sustainably drive quality gains. This approach promises to improve patient outcomes and enhance the overall quality and efficiency of the health system, resonating with broader calls for healthcare reform towards more patient-centered, value-based models of care [9–11]. In conclusion, our study reinforces the critical importance of perceived PCC in enhancing patient satisfaction among patients with diabetes. It highlights the need for health systems to consider demographic factors in healthcare delivery. By building on the principles of PCC and addressing the unique needs of diverse patient

Path	Unstandardized Regression Weight	Std Error	P
PCC <- Income	0136	0.031	***
PCC <- Education	0.082	0.026	0.001
PS < - Income	0.073	0.025	0.004
PS < Education	0.017	0.021	0.001
	0.726	0.021	***
	0.833	0.048	***
	0.055	0.053	***
	0.054	0.055	***
	0.991	0.059	***
	0.679	0.038	***
	0.078	0.049	***
	1,000	0.040	
	0.041	0.046	***
	0.841	0.024	***
	0.731	0.034	***
PP2 <- PP	0.896	0.039	***
PP3 <- PP	0.866	0.041	***
PP4 <- PP	0.840	0.056	***
PP5 <- PP	1.000	0.024	***
PP6 <- PP	0.991	0.034	
PP/ <- PP	0.8/1	0.037	***
PC1 <- PC	0.904	0.058	***
PC2 <- PC	1.000		
PC3 <- PC	0.726	0.045	***
PC4 <- PC	0.912	0.057	***
PC5 <- PC	0.701	0.047	***
CC1 <- CC	0.873	0.051	***
CC2 <- CC	0.956	0.047	***
CC3 <- CC	1.000		
CC4 <- CC	0.921	0.065	***
CT4 <- CT	1.000		
CT3 <- CT	0.952	0.046	***
CT2 <- CT	0.881	0.044	***
CT1 <- CT	0.933	0.056	***
AC1 <- AC	0.701	0.053	***
AC2 <- AC	0.824	0.045	***
AC3 <- AC	1.000		
AC4 <- AC	0.863	0.062	***
AC5 <- AC	0.618	0.051	***
ES4 <- ES	0.836	0.048	***
ES3 <- ES	1.000		
ES2 <- ES	0.954	0.041	***
ES1 <- ES	0.984	0.040	***
FF3 <- FF	0.928	0.047	***
FF2 <- FF	0.829	0.043	***
FF1 <- FF	1.000		
IE4 <- IE	0.740	0.037	***
IE3 <- IE	0.920	0.057	***
IE2 <- IE	1.000		
IE1 <- IE	0.857	0.038	***
PS1 <- PS	0.859	0.046	***
PS2 <- PS	0.797	0.055	***
PS3 <- PS	0.908	0.040	***
PS4 <- PS	1.000		

## Table 4 Summary of path coefficients and factor loading weights between variables

\*\*\* p-value less than 0.001

populations, healthcare providers can offer more personalized, effective, and satisfying care experiences.

#### Strength and limitations

To the best of our knowledge, this is the first study to examine the relationship between PCC dimensions and patient satisfaction among patients with diabetes. The study utilized a large and diverse sample that exceeded the required threshold determined by the sample size calculation, enhancing the generalizability of the findings. The sample included patients with diabetics in 47 primary healthcare centers, further strengthening its representativeness. Additionally, the study employed a random sampling technique and face-to-face data collection, ensuring the reliability and accuracy of the results. Validated instruments were used to measure PCC and patient satisfaction, providing valuable insights into their relationship.

Despite its valuable contributions, this study has several limitations that suggest areas for future exploration. First, although a cross-sectional design hinders establishing a relation between perceived PCC and patient satisfaction, this snapshot still provides a valuable foundation for understanding current relationships between these factors. Future longitudinal studies could build on these insights, providing a more precise understanding of causal relationships and illustrating how patient satisfaction may evolve with sustained PCC interventions.

Next, the study's location in Saudi Arabia may limit the generalizability of findings to other contexts with different health systems, cultures, and patient demographics. Future research should aim to investigate PCC's impact on patient satisfaction across various geographic and healthcare settings to validate and expand upon these findings.

Last, while the study examined many demographic and health factors as controlling, income and education only show a significant relationship. Future studies could check other potentially influential variables, such as cultural beliefs and health literacy, and explore these and other factors to better understand how diverse elements interact to influence patient satisfaction within PCC frameworks. Additionally, qualitative methods like interviews or focus groups could complement quantitative findings by delving deeper into patients' perceptions and experiences regarding PCC. These methods could also shed light on healthcare providers' perspectives on the challenges and opportunities in effectively implementing PCC strategies.

Ultimately, however, this study underscores the positive correlation between perceived PCC and patient satisfaction among patients with diabetes, emphasizing the importance of considering demographic factors in care delivery. Future research should expand on these findings to address the complexities of implementing PCC across diverse healthcare settings, aiming to improve patient satisfaction, experiences, health outcomes, patient trust, and perceived value.

### Conclusion

This study has provided essential insights into the role of PCC in enhancing patient satisfaction among patients with diabetes in primary healthcare centers in Jeddah, Saudi Arabia. The main finding is that PCC was strongly associated with patient satisfaction. The findings underscore the significance of key dimensions of perceived PCC – physical comfort, information and education, continuity in care transition, family and friends, and access to care - in positively influencing patient satisfaction. However, other PCC components, such as patient preferences, coordination of care, and emotional support, did not appear to have a significant relationship with patient satisfaction. Moreover, the study highlighted the effects of demographic factors, such as monthly income and educational level on the PCC and patient satisfaction, pointing to the importance of tailoring healthcare services to meet patients' diverse needs and expectations. Through emphasizing the essential elements of PCC and recognizing the influence of socioeconomic factors, this study contributes to the ongoing efforts to improve healthcare delivery and outcomes for patients with diabetes. The study supports the call for health systems to prioritize and fully integrate PCC principles into their operations and service delivery models, especially in regions like Saudi Arabia. Doing so aligns with global health objectives and patient care standards and promises to enhance patient satisfaction, adherence to treatment plans, and overall health outcomes. Continued research optimizing PCC provision aligned with disease complexities, population diversity, and health reform agendas holds promise for establishing highly reliable, globally benchmarked models of sustainable patientcentered care. Policymakers should prioritize integrating patient-centered care principles into healthcare policies, ensuring services are adaptable to patient demographics and tailored to enhance service quality and health outcomes.

### Implications for research and practice

The findings of this study have significant implications for both research and clinical practice. The results emphasize the critical role of PCC in enhancing patient satisfaction in managing diabetes. Healthcare providers and policymakers should integrate PCC principles into routine diabetes care by training them to increase communication, empathy, and responsiveness to the needs of their patients. Further, healthcare systems should invest in improving the accessibility and quality of primary healthcare centers in order to ensure patient satisfaction. Assessing PCC and patient satisfaction can frequently contribute to monitoring progress and guiding targeted interventions to improve the outcome of diabetes care. As a result of linking research and practice, these findings provide several actionable steps that can be taken to enhance the experience and outcomes of patients.

## **Supplementary Information**

The online version contains supplementary material available at https://doi.or g/10.1186/s12875-025-02778-1.

Supplementary Material 1

Supplementary Material 2

#### Acknowledgements

The authors would like to thank the patients who participated in this study. We also extend our gratitude to the Central Institutional Review Board (IRB) at the Saudi Arabia Ministry of Health for their ethical approval and guidance throughout this research.

#### Author contributions

All authors collectively undertook the development and design of the study. N.A. and A.A.A. took the lead in collecting data, while all authors were engaged in material preparation and data analysis. N.A. composed the first draft of the manuscript, which was then enhanced through the contributions and feedback of all authors on prior versions. The final manuscript received approval from each author. The distribution of roles was as follows: Conceptualization by N.A., M.P., A.A., W.G.; Methodology by N.A., M.P., A.A.A.; Formal Analysis and Investigation by N.A., A.A., M.P., W.G.; Writing - Initial Draft by N.A.; Reviewing and Editing the Manuscript by N.A., M.P., W.G.; Supervisory role by M.P., W.G.

#### Funding

This research was funded by King Abdul-Aziz University (KAU), Jeddah, Saudi Arabia. The authors gratefully acknowledge and thank KAU for its technical and financial support.

#### Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

## Declarations

#### Ethics approval and consent to participate

Ethical approval was obtained from the Central Institutional Review Board (IRB) at the Saudi Arabia Ministry of Health (log number: A01569) and the Ethics Review Committee at the Faculty of Health, Medicine & Life Sciences at Maastricht University in accordance with the relevant guidelines and regulations in Ethics Approval and Consent to participate as described in the Declaration of Helsinki. (Approval number: FHML-REC/2023/045).

#### **Consent to participate**

Before participation, each respondent was provided with an information letter detailing the study's purpose, ethical considerations, and their rights as participants. Informed consent was obtained from all participants prior to their inclusion in the study. Each respondent signed a consent form after reviewing the provided information, ensuring transparency in the research process.

#### **Consent for publication**

All participants provided informed consent for the publication of the results of this study. All authors approved the final version of the manuscript.

#### **Competing interests**

The authors declare no competing interests.

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## Received: 25 June 2024 / Accepted: 4 March 2025 Published online: 01 May 2025

#### References

- 1. Ahmad E, et al. Type 2 diabetes. Lancet. 2022;400(10365):1803-20.
- Diabetes Paho/WHO| Pan American Health Organization. (2023).https://www. paho.org/en/topics/diabetes 2023, Pan American Health Organization.
- Al-Wagdi BE, Al-Hanawi MK. Knowledge, attitude and practice toward diabetes among the public in the Kingdom of Saudi Arabia: a cross-sectional study. Front Public Health. 2024;12:1326675.
- World Health Organization.Diabetes.. 2023 [cited 2023 25 November]; Available from: https://www.who.int/health-topics/diabetes#tab=tab\_1
- Ogurtsova K, et al. IDF diabetes atlas: global estimates of undiagnosed diabetes in adults for 2021. Diabetes Res Clin Pract. 2022;183:109–18.
- Sun H, et al. IDF diabetes atlas: global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diabetes Research and Clinical Practice; 2022. p. 183.
- Saudi Arabia; Euromonitor; United Nations; World Bank; IMF; General Authority for Statistics (Saudi Arabia); SAMA; Ministry of Health (Saudi Arabia); Colliers International; Statista; OPEC; 2016 to 2020. [cited 2024 16–12]; Available from: https://www.statista.com/statistics/1381717/saudi-arabia-prevalence-of-diab etes/
- Abusalah MAH, et al. Prevalence of type 2 diabetes mellitus in the general population of Saudi Arabia, 2000–2020: A systematic review and meta-analysis of observational studies. Saudi J Med Med Sci. 2023;11(1):1–10.
- 9. Landgren E. Person-centred care and preferred outcomes in early rheumatoid arthritis—the patients' perspective. 2024.
- Abdalla R, Pavlova M, Groot W. Association of patient experience and the quality of hospital care. Int J Qual Health Care. 2023;35(3):mzad047.
- 11. Alsubahi N, et al. Healthcare quality from the perspective of patients In Gulf Cooperation Council countries: A systematic literature Review. In Healthcare. MDPI; 2024.
- Picker Institute. Principles of patient centred care. 2015 [cited 2024; Available from: https://picker.org/who-we-are/the-picker-principles-of-person-centre d-care/
- Jackson K, Newbury-Birch D. Patient reported experiences of community rehabilitation and/or support services for people with long term neurological conditions: a narrative review of quantitative studies. Disabil Rehabil. 2024;46(18):4068–85.
- Alhenaidi A, et al. Patient satisfaction of primary care services in Gulf Cooperation Council countries: A scoping review. J Gen Family Med. 2023;24(5):279–87.
- 15. Omaghomi TT, et al. Patient experience and satisfaction in healthcare: a focus on managerial approaches-a review. Int Med Sci Res J. 2024;4(2):194–209.
- Chen T-T, Su W-C, Liu M-I. Patient-centered care in diabetes care-concepts, relationships and practice. World J Diabetes. 2024;15(7):1417.
- Prayoonhong W, Sonsingh W, Permsuwan U. Clinical outcomes and economic evaluation of patient-centered care system versus routine-service system for patients with type 2 diabetes in Thailand. Heliyon, 2024. 10(3).
- Al Mahrouqi AS, et al. Patient-centred care, diabetes self-management and glycaemic control among Omani patients with type-2 diabetes. Int J Nurs Pract. 2023;29(1):e13103.
- Köse S, et al. Examining the interplay of self-efficacy and emotional autonomy on diabetic control index. J Pediatr Nurs. 2024;78:60–5.
- 20. Gulliford MC, Naithani S, Morgan M. Continuity of care and intermediate outcomes of type 2 diabetes mellitus. Fam Pract. 2007;24(3):245–51.

- 22. AlHaqwi Al, et al. Impact of patient-centered and self-care education on diabetes control in a family practice setting in Saudi Arabia. Int J Environ Res Public Health. 2023;20(2):1109.
- Su M, et al. The association between patient-centered communication and primary care quality in urban China: evidence from a standardized patient study. Front Public Health. 2022;9:779293.
- 24. Abdel-Rahman N, et al. What is important for people with type 2 diabetes? A focus group study to identify relevant aspects for Patient-Reported outcome measures in diabetes care. PLoS ONE. 2022;17(11):e0277424.
- Zeh S, et al. What do patients expect? Assessing patient-centredness from the patients' perspective: an interview study. BMJ Open. 2021;11(7):e047810.
- 26. Kanat M, et al. Patient-centeredness in the multimorbid elderly: a focus group study. BMC Geriatr. 2021;21:1–12.
- Alsulamy N, et al. Views of stakeholders on factors influencing shared decision-making in the Eastern mediterranean region: a systematic review. East Mediterr Health J. 2021;27(3):300–11.
- Aljuaid M, et al. Psychometric evaluation of the Arabic Language personcentred climate questionnaire—staff version. J Nurs Adm Manag. 2018;26(4):449–56.
- Aljuaid M, et al. Quality of care in university hospitals in Saudi Arabia: a systematic review. BMJ Open. 2016;6(2):e008988.
- 30. Cavana R, Delahaye B, Sekeran U. Applied business research: qualitative and quantitative methods. Wiley; 2001.
- STATS. General Authority for Statistics: the Kingdom of Saudi Arabia 2023; Available from: https://www.stats.gov.sa/en/node
- Armstrong RA. Is there a large sample size problem? 2019, Wiley Online Library. pp. 129–130.
- Andrade C. Sample size and its importance in research. Indian J Psychol Med. 2020;42(1):102–3.
- Williams GC, Freedman ZR, Deci EL. Supporting autonomy to motivate patients with diabetes for glucose control. Diabetes Care. 1998;21(10):1644–51.
- Williams GC, et al. Promoting glycemic control through diabetes self-management: evaluating a patient activation intervention. Patient Educ Couns. 2005;56(1):28–34.
- Cramm JM, Nieboer AP. Validation of an instrument for the assessment of patient-centred care among patients with Multimorbidity in the primary care setting: the 36-item patient-centred primary care instrument. BMC Fam Pract. 2018;19:1–10.
- Shaller D. Patient-centered care: what does it take? Commonwealth Fund New York; 2007.
- Tsung-Tai C, et al. The satisfaction with care of patients with schizophrenia in Taiwan: a cross-sectional survey of patient-centered care domains. J Nurs Res. 2023;31(2):e268.
- Birhanu F et al. Patient-centered care and associated factors at public and private hospitals of addis Ababa: patients' perspective. Patient Relat Outcome Measures, 2021: pp. 107–16.
- G/egziabher R et al. Patient-centered care and associated factors among Adult Admitted patients in south wollo public hospitals, Northeast Ethiopia. Patient preference and adherence, 2022: pp. 333–342.
- 41. Rossom RC, et al. The effects of patient-centered depression care on patient satisfaction and depression remission. Fam Pract. 2016;33(6):649–55.
- 42. Wolf DM, et al. Effect of patient-centered care on patient satisfaction and quality of care. J Nurs Care Qual. 2008;23(4):316–21.
- 43. Organization WH. WHO guidelines on translation and adaptation of instruments. Geneva, Switzerland: World Health Organization; 2018.
- Taber KS. The use of Cronbach's alpha when developing and reporting research instruments in science education. Res Sci Educ. 2018;48:1273–96.
- Schreiber JB. Core reporting practices in structural equation modeling. Res Social Administrative Pharm. 2008;4(2):83–97.
- Hair JF, Gabriel M, Patel V. AMOS covariance-based structural equation modeling (CB-SEM): guidelines on its application as a marketing research tool. Brazilian J Mark, 2014. 13(2).
- Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika. 1951;16(3):297–334.
- Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. J Mark Res. 1981;18(1):39–50.
- Williams GC, et al. Reducing the health risks of diabetes. Diabetes Educ. 2009;35(3):484–92.

- Buawangpong N, et al. Incorporating the patient-centered approach into clinical practice helps improve quality of care in cases of hypertension: a retrospective cohort study. BMC Fam Pract. 2020;21(1):1–8.
- Kochuvilayil A, Varma RP. Navigating the caregiving pathway: Understanding the contextual influences on sense of coherence among family caregivers. Cureus, 2024. 16(4).

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Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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