Scientific Research Publishing

Open Journal of Pediatrics, 2025, 15(5), 796-811
https://www.scirp.org/journal/ojped
ISSN Online: 2160-8776
ISSN Print: 2160-8741

Factors Associated with Therapeutic Adherence in Children with Type 1 Diabetes Followed at Treichville Teaching Hospital in Côte d'Ivoire

Gneneyeri Joseph Ouattara[1,2*], Lassina Cissé[1,2], Charlotte Niamien-Attai[1], Bossoma Guylaine Aka[1,2], Yamissa Koné[2], Monthé Laetitia Doundjo[2], Amos Ankotché[1,2,3]

[1]Faculty of Medical Sciences, Felix Houphouet-Boigny University, Abidjan, Côte d'Ivoire
[2]Department of Pediatrics, Treichville Teaching Hospital, Abidjan, Côte d'Ivoire
[3]Diabetes Unit, Treichville Teaching Hospital, Abidjan, Côte d'Ivoire
Email: *jgouattara@gmail.com

How to cite this paper: Ouattara, G.J., Cissé, L., Niamien-Attai, C., Aka, B.G., Koné, Y., Doundjo, M.L. and Ankotché, A. (2025) Factors Associated with Therapeutic Adherence in Children with Type 1 Diabetes Followed at Treichville Teaching Hospital in Côte d'Ivoire. *Open Journal of Pediatrics*, **15**, 796-811.
https://doi.org/10.4236/ojped.2025.155075

Received: August 5, 2025
Accepted: September 12, 2025
Published: September 15, 2025

Abstract

Introduction: The prognosis of type 1 diabetes (T1D) in children depends on strict adherence to treatment, which remains a major challenge in Sub-Saharan Africa, particularly in Côte d'Ivoire. **Objectives:** This study aims to identify factors influencing therapeutic adherence in children with diabetes followed at Treichville University Hospital. **Materials and Methods:** An analytical cross-sectional study was conducted on 74 children aged 3 to 18 years who were being followed for T1D. Socio-demographic data, knowledge about the disease, and treatment adherence were collected using medical records and structured questionnaires. **Results:** The mean age of the patients was 13.9 years (71.6% were adolescents). Children managed their own treatment in 63.5% of cases. The mean HbA1c was 10.55%, with 73.2% of patients having an HbA1c > 8%. Poor adherence was observed in 47.8% of children. Adherence was highest among children aged 0 to 6 years (100%). Factors significantly associated with better adherence included acceptance of the disease ($p = 0.0001$; OR = 16.7 [95% CI: 4.26 - 65.53]), parental involvement ($p = 0.03$; OR = 2.81 [95% CI: 1.06 - 7.48]), and good knowledge about diabetes ($p = 0.03$; OR = 0.35 [95% CI: 0.13 - 0.92]). **Conclusion:** Improving treatment adherence requires age-appropriate therapeutic education tailored to the cultural context, along with psychosocial support.

Keywords

Type 1 Diabetes, Children, Associated Factors, Treatment Adherence, Côte d'Ivoire

1. Introduction

Type 1 diabetes is an autoimmune metabolic disorder characterized by the destruction of beta cells in the islets of Langerhans, leading to partial or complete insulin deficiency. Its progression is marked by numerous acute and chronic complications [1]. It is one of the most common chronic diseases in children and represents a major challenge due to its clinical complexity and the daily demands of therapeutic management [2].

Globally, in 2017, the prevalence of type 1 diabetes was estimated at 586,000 children under 15 years of age [3]. Between 2011 and 2021, the number of type 1 diabetes cases among children and adolescents under 19 years increased fivefold in the African region, rising from 4 to 20 cases per 1000 children [4]. In Côte d'Ivoire, in 1995, Lokrou *et al*. reported a prevalence of type 1 diabetes in children and adolescents of 1.52% [5]. As with all chronic conditions, type 1 diabetes in children requires specialized follow-up and rigorous management involving patients and their families, particularly regarding regular insulin administration, blood glucose monitoring, diet, and physical activity [6] [7]. Poor treatment adherence compromises treatment safety and efficacy, leading to increased mortality and morbidity, as well as substantial direct and indirect costs for the healthcare system [8].

Located within Treichville Teaching Hospital—the leading medical referral center in Côte d'Ivoire—the diabetes clinic plays a crucial role in managing young diabetic patients aged 0 to 25 years, thanks to its policy of free care. However, two deaths among adolescent diabetic patients followed at Treichville Teaching Hospital were recorded in February 2025 (in the context of ketoacidosis) in the pediatric department. The two cases were adolescents aged 13 and 15 who had been screened and monitored under the CDiC program for 1 year and 6 months for one, and for 9 months for the other. They had been diagnosed in the pediatric department following inaugural complications (diabetic ketoacidosis coma). After treatment, they were placed on outpatient insulin therapy within the framework of the "Changing Diabetes in Children" (CDiC) program. Follow-up for these adolescents was irregular (failure to attend scheduled follow-up and therapeutic education appointments). They were readmitted to the department following neurological complications, and death occurred despite the treatment initiated.

These fatalities raised suspicion of underlying issues related to treatment non-adherence. In light of this situation, we sought to identify the factors associated with treatment adherence among children with type 1 diabetes followed at Treichville Teaching Hospital. To address this question, we conducted this study with

the aim of identifying these factors and understanding how they influence treatment adherence. Our working hypothesis was that children with type 1 diabetes who have better knowledge of the disease would exhibit higher levels of treatment adherence.

2. Patients and Methods

2.1. Study Design, Setting, and Duration

This was an analytical cross-sectional study conducted in the pediatric department and the diabetes unit of Treichville Teaching Hospital.

The diabetes unit operates from Monday to Friday, 7:30 AM to 4:30 PM. It holds four main consultation days: Monday through Thursday for scheduled appointments for both adult and pediatric patients, while Friday is dedicated to therapeutic education sessions covering diabetes, its complications, nutrition, and lifestyle measures. The unit's activities include medical consultations (an average of 30 patients per day for three physicians scheduled daily), patient observation (day hospital care for parenteral treatments and other minor complications), and therapeutic education sessions (covering recommended physical activities and their duration, diet, the different types of insulin used, injection techniques, understanding the disease, possible complications, and the follow-up program). The unit also organizes training for physicians from other healthcare facilities, as well as diabetes screening and awareness campaigns.

Children followed-up are examined at least once every three months by the physician responsible for pediatric care, focusing on clinical management and therapeutic education. For children who have started treatment, follow-up visits take place weekly during the first three months. When glycemic control is good and the treatment is well managed, appointments are scheduled every three months.

Children are also followed daily in the pediatric ward, undergo quarterly checkups, and are admitted to the pediatric emergency unit when complications arise. An organized system is in place within these care units to ensure appointment compliance, clinical and biological monitoring, assessment of diabetes-related knowledge, and therapeutic education. Additionally, all patients receive free insulin, glucometers, glucose test strips, and follow-up notebooks through the "Changing Diabetes in Children" (CDiC) program.

Data collection took place over a two-month period, from March 1 to April 30, 2025.

2.2. Study Population

The study population consisted of children living with type 1 diabetes who were followed at Treichville Teaching Hospital.

2.3. Inclusion Criteria

Included were children diagnosed with type 1 diabetes at least three months prior to the start of the study, whose parents provided informed consent. Older children

also gave oral assent to participate.

2.4. Exclusion Criteria

Children with other chronic conditions (e.g., psychiatric disorders, intellectual disabilities, chronic kidney disease, cancer) were excluded.

2.5. Sample Size

Sample size was calculated using the Schwartz formula:

Z = 1.96; margin of error (e) = 10%; prevalence (p) = 27% (based on Boiro *et al*. [9]). This yielded a minimum required sample size of 71 participants.

2.6. Data Collection Procedure

After obtaining research approvals, all medical records of eligible children were reviewed. Patients were then contacted by the diabetes unit coordinator via telephone to schedule appointments according to their availability, with transportation costs reimbursed. Interviews were conducted either with the child alone or accompanied by parents, in a private office, ensuring confidentiality, lasting approximately 15 minutes on average. All questions were administered by the principal investigator.

2.7. Variables Studied

Socio-demographic characteristics (age, gender, family structure, parental occupation, caregiver identity and education level, and socio-economic status).

Diabetes-related characteristics (age at diagnosis, disease duration, circumstances of diagnosis, person responsible for blood glucose monitoring and insulin administration, daily glucose monitoring frequency, insulin therapy regimen, pharmacy refill practices during supply shortages, type of physical activity).

2.8. HbA1c Levels

Level of diabetes knowledge among children and/or parents.

Degree of treatment adherence and factors affecting it.

2.9. Data Analysis

Data were collected using Google Forms and stored in Google Sheets, then exported to Excel 2021 for descriptive analysis. Univariate analysis was performed using XLSTAT 2019. Associations between qualitative variables were assessed using the chi-square test and Fisher's exact test. Comparisons between qualitative and quantitative variables used ANOVA; when ANOVA assumptions were not met, the Kruskal-Wallis test was applied. A p-value < 0.05 was considered statistically significant.

For odds ratio (OR) calculations, the outcome variable—treatment adherence—was dichotomized: good/moderate adherence = good adherence; poor adherence = poor adherence. Similarly, diabetes knowledge was categorized as: sufficient

knowledge (good/moderate) vs. insufficient knowledge.

2.10. Operational Definitions

- Child: Individual under 18 years of age.
- Caregiver: The person in the household most involved in the child's treatment and follow-up.
- Socio-economic status: Assessed using a scoring grid based on objective criteria from the 2015 Côte d'Ivoire Household Living Standards Survey (ENV), classified into three levels: low, medium, and high [10].
- Diabetes knowledge: Evaluated using a questionnaire developed based on a literature review and the CDiC Côte d'Ivoire (2017-2020) quarterly patient follow-up form.
- Treatment adherence: The DSMQ (Diabetes Self-Management Questionnaire) was initially considered but abandoned due to its length and because some questions were contextually inappropriate or difficult for participants to understand [11]. Instead, the shorter and more accessible Morisky Green Levine Medication Adherence Questionnaire (MAQ-R) was used.

Adherence to insulin therapy was assessed using the 4-item Morisky Green Levine scale, with yes/no responses scored 0 or 1.

The items were as follows:

- Do you sometimes forget to take your insulin injections?
- Are you sometimes careless when you have to take your insulin injections?
- When you feel better, do you sometimes stop taking your insulin injections?
- When you feel unwell while taking your insulin injections, do you sometimes stop the treatment?

Patients were classified into three groups based on total score: good adherence (4), moderate adherence (2 - 3), and poor adherence (0 - 1). This scale has demonstrated good reliability in diabetic children aged 6 - 18 years, with a Cronbach's alpha of 0.857 [12].

Acceptance of the disease: awareness of one's physical condition after discussion with the staff, self-assessment, and active acceptance (recognizing oneself as ill, therefore having an insulin deficiency). This involves acknowledging one's state of health and being willing to accept therapeutic treatment.

2.11. Ethical Considerations

The study protocol was approved by the Medical and Scientific Directorate of Treichville Teaching Hospital. Data collection adhered strictly to ethical and professional standards.

The children and parents enrolled in the Changing Diabetes in Children (CDiC) program for follow-up and management had already provided written informed consent at the time of enrollment. It had been specified that the data collected would be used as a scientific database (to better understand the disease and raise public awareness). Thus, for the purposes of this study, only the oral consent of

parents and of children over the age of 10 was obtained before the start of the interview, in compliance with the recommendations of the Helsinki Declaration.

Interviews were conducted in a confidential setting. Participant anonymity was maintained, and data were used solely for scientific purposes.

3. Results

During the study period, 182 patients were under 18 years of age; 74 were included, representing an inclusion rate of 40.6%. Socio-demographic characteristics are presented in Table 1. Data regarding insulin use are shown in Table 2.

Table 1. Socio-demographic characteristics (n = 74).

Variable	Frequency (n)	Percentage (%)	Mean ± SD
Mean age			13.91 ± 1
Age group			
0 - 6 years	6	8.10	
7 - 12 years	15	20.27	
13 - 18 years	53	71.62	
Gender			
Female	37	50	
Male	37	50	
Child's living arrangement			
Mother only	12	16.21	
Father only	4	5.40	
Both parents	48	64.86	
Guardian/tutor	10	13.51	
Socio-economic status			
Low	5	6.75	
Moderate	60	81.08	
High	9	12.17	
Primary caregiver responsible for care			
Child himself/herself	47	63.51	
Sibling	2	2.70	
Mother	19	25.67	
Father	3	4.05	
Guardian/tutor	3	4.05	
Education level of the caregiver			
None	6	8.10	
Primary	5	6.75	
Secondary	50	67.56	
Tertiary/higher	13	17.56	

Table 2. Diabetes history (n = 74).

Variable	Frequency (n)	Percentage (%)	Mean ± SD
Mean age at diabetes diagnosis			10.90 ± 0.85
Mean duration of the disease			3.90 ± 0.62
Family history of diabetes			
Yes	26	35.14	
No	48	64.86	
Circumstances of diagnosis			
Coma	14	18.91	
Screening	5	6.75	
Infection	17	22.97	
Malaria	2	2.70	
Polyuria-polydipsia syndrome	36	48.64	

Table 3. Insulin therapy and glycemic monitoring (n = 74).

Variable	Frequency (n)	Percentage (%)
Who administers insulin?		
Child	65	87.83
Mother	6	8.10
Mother and child	1	1.35
Father and mother	2	2.70
Who performs blood glucose monitoring?		
Child	62	83.78
Mother	7	9.45
Mother and child	2	2.70
Father and mother	3	4.05
Number of daily blood glucose checks		
≤1 per day	43	58.10
[2 - 3] per day	31	41.89
Number of daily insulin injections		
≤1 injection	10	13.51
[2 - 3] injections	59	79.73
>3 injections	5	6.75
Trained in the use of a glucometer?		
Yes	67	90.54
No	7	9.46
Have you ever omitted a blood glucose result?		
Yes	17	34.00
No	50	66.00

Table 4. HbA1c levels at diagnosis and current values (n = 74).

Variable	Frequency (n)	Percentage (%)	Mean ± SD
Mean HbA1c at diagnosis			11.14 ± 0.64
HbA1c at diagnosis			
<7%	5	9.43%	
7% - 8%	6	11.32%	
>8%	42	79.24%	
Current mean HbA1c			10.55 ± 0.66
Current HbA1c			
<7%	5	7.04%	
7% - 8%	14	19.71%	
>8%	52	73.23%	

Regarding knowledge about diabetes and therapeutic adherence: Seven parents or guardians and 67 children were interviewed. During this interview, 2.98% (2) of the children had good knowledge of diabetes, 53.73% (36) had average knowledge, and 43.29% (29) had poor knowledge (Table 3 and Table 4).

As for the parents or guardians, 28.57% (2) had good knowledge of diabetes, and 71.43% (5) had average knowledge.

Regarding adherence to treatment: Adherence was good in 10 children (7.4%), average in 32 children (43.2%), and poor in 32 children (43.2%).

The main reasons for poor adherence were forgetfulness (7 cases), refusal of injections (20 cases), stock shortages, unavailability of parents (3 cases), limited financial means, and distance—with the last two reported in one case each (Tables 5-7).

Table 5. Socio-economic factors associated with therapeutic adherence.

Variable	Adherence		Odds Ratio (95% CI)	p-value
	Good (n = 42)	Poor (n = 32)		
Age group				
0 - 6 years	6	0	10.01 (0.53 - 186.52)	0.04
7 - 12 years	6	9		
13 - 18 years	30	23		
Gender				
Male	25	12		0.06
Female	17	20		
Socio-economic level				
Low	1	4		0.20
Moderate	38	22		
High	6	3		

Continued

Parent/guardian's occupation				
Farmer	1	2		
Merchant	4	8		**0.17**
Employee	27	14		
Unemployed	10	8		
Caregiver's education level				
None	4	2		
Primary	2	3		0.63
Secondary	27	23		
Higher	9	4		

Table 6. Insulin therapy factors associated with therapeutic adherence.

Variable	Adherence		OR (95% CI)	p-value
	Good (42)	Poor (32)		
Who administers the insulin?				
Child	35	30		
Mother	4	2		0.64
Mother and child	1	0		
Father and mother	2	0		
Who monitors blood glucose?				
Child	31	31		
Mother	6	1		0.06
Mother and child	2	0		
Father and mother	3	0		
Number of blood glucose checks per day				
2 - 3 times	24	7	4.76 (1.69 - 13.43)	0002
≤1 time	18	25		
Number of insulin injections per day				
>3 injections	5	0	0.07 (0.008 - 0.60)	0.001
2 - 3 injections	36	23		
≤1 injection	1	9		
Training on glucometer use				
Yes	41	26	9.46 (1.07 - 83.14)	0.04
No	1	6		
Parental involvement in treatment				
Yes	31	16	2.81 (1.06 - 7.48)	0.03
No	11	16		
Insulin therapy protocol				
2-injection regimen	1	3		0.50
3-injection regimen	29	21		
≥4-injection regimen	12	8		
Current Hb1Ac level				
≤8	19	0	42.48(2.4-750.5)	0.001
>8	21	31		

Table 7. Knowledge and attitudes associated with therapeutic adherence.

Variable	Adherence		OR (95% CI)	p-value
	Good (42)	Poor (32)		
Level of knowledge				
Good	30	15	0.35 (0.13 - 0.92)	0.032
Poor	12	17		
Acceptance of the disease				
Yes	39	14	16.67 (4.26 - 65.53)	0.0001
No	3	18		
Confidence in treatment efficacy				
Yes	42	15	0.01 (0.001 - 0.18)	0.0001
No	0	17		
Constraints related to hygienic-dietary measures				
Yes	11	12		0.29
No	31	20		
Scheduling conflict between injections and daily activities				
Yes	11	16	0.35 (0.13 - 0.93)	0.03
No	31	16		
Food restrictions				
Yes	10	7		0.84
No	32	25		
Physical activity practice				
Never	3	3	0.93 (0.17 - 4.99)	0.02
Occasionally	31	29		
Regularly	8	0		

4. Discussion

4.1. Study Limitations

The relatively small sample size may reduce the power of the results, and recruitment from a single center could limit representativeness, potentially introducing selection bias. The assessment of knowledge was conducted using a non-standardized tool that may be incomplete and lacked cross-cultural validation. Additionally, the Morisky Green Levine adherence scale, although a reliable self-reporting method, remains subjective and less precise than other documented methods. It also does not account for two other essential aspects of diabetes management: diet and physical activity. Lastly, the small number of parents in the sample limits the interpretation of factors such as parental involvement.

Despite these limitations, the findings raise important points for discussion.

4.2. Socio-Demographic Characteristics

The mean age was 13.9 years, with a sex ratio of 1, indicating an even distribution between males and females. Adolescents aged 13 to 18 years were the most repre-

sented group. These results are consistent with those from Massi Idrissa *et al*. in Abidjan (2022), Boiro *et al*. in Senegal, and Ngwiri *et al*. in Kenya, reflecting a common overrepresentation of adolescents in pediatric diabetes studies across Sub-Saharan Africa [9] [13] [14].

Most participants lived in two-parent households, a figure comparable to Massi Idrissa *et al*. [13] but higher than that reported by Niba *et al*. in Cameroon [15]. The predominance of two-parent families in our study may reflect local cultural specificities and may offer an advantage in treatment adherence.

Therapeutic adherence in this population often involved an identified caregiver. In our study, the majority of diabetic children managed their care independently. This differs from Niba *et al*., where mothers were the primary caregivers. This discrepancy, with a high proportion of self-managing children in our study, may be due to the relatively high average age (13.9 years) or the fact that the questionnaire in Niba's study was completed by parents rather than the children themselves [15].

Most caregivers in our study had a secondary education level. These findings are consistent with Kyokunzire *et al*. in Uganda, where 66% of caregivers had completed secondary school [16]. The predominance of adolescents in our sample partly explains this, as their parents may be better educated. This higher level of education likely contributes to a better understanding of disease management and may enhance treatment adherence.

Furthermore, most children came from families with a modest socio-economic status. This differs from Niba *et al*., where 69.7% of participants had low socio-economic status. This discrepancy may be due to the geographic setting of our study, conducted in an urban area, compared to the rural setting of Niba's study [15].

4.3. Diabetes History and Follow-Up

The mean age at diagnosis in our study was 10.9 ± 0.85 years, with an average disease duration of 3.9 ± 0.6 years. The most common presentation was the classic polyuria-polydipsia syndrome. These results are similar to those from Ngwiri *et al*. and Noyerie (Nantes, France, 2022) [14] [17], suggesting that diabetes onset often precedes adolescence and may reflect challenges in early diagnosis or limited awareness of early symptoms.

A family history of diabetes was found in one-third of participants. This varied across studies: 57% in Uganda, 40% in northwestern Cameroon, and 29.6% in Thi-Qar, Iraq [15]-[18]. Such variability may be attributed to ethnic-genetic differences in susceptibility to type 1 diabetes.

Insulin therapy and self-monitoring of blood glucose were primarily managed by the children themselves in more than six out of seven cases. However, fewer than three in seven performed 2 - 3 daily blood glucose checks. These findings align with Djonou *et al*. in Cameroon, where 51.6% of patients reported 2 - 3 daily checks [19]. The similarity could be due to comparable methodologies, where children were interviewed without parental presence, limiting reporting bias.

Regarding insulin regimens, 79.7% of participants received 2 - 3 injections per day, with 3-injection regimens being most common (67.5%). These findings echo Djonou *et al*., where over two-thirds followed regimens with at least 3 injections per day. This preference may be due to ease of application, improving adherence among young patients [19].

Therapeutic adherence and glycemic control were reflected in HbA1c levels. Our data revealed suboptimal control, with a mean HbA1c of 10.55%. Despite a modest improvement of 0.59% compared to the initial diagnosis, the reduction was insufficient: 90% of patients had HbA1c > 7%. Similar results were found by Kyokunzire *et al*. (80.5%) and Darwish in Egypt (92%) [16] [20]. The better outcomes reported by Noyerie (58% of poorly controlled patients at 1 year) may stem from their longitudinal study design, more structured management, and more favorable socio-economic context in Europe [17]. Ideally, the mean HbA1c should be maintained below 7%; however, achieving this target remains challenging across all settings and socio-economic contexts. Therapeutic strategies should therefore account for the unique physiological and psychosocial characteristics of adolescence.

4.4. Knowledge

The evaluation of diabetes knowledge, as part of therapeutic education, showed concerning levels among young patients. Only 5.4% had good knowledge, while 39.1% had poor and 55.4% average knowledge. These findings partially match those of Geneti *et al*. in Ethiopia, who reported 17.1% with good knowledge, and confirm the predominance of poor-to-average levels (50.5% and 32.3%) [21].

Owusu *et al*. in Ghana added further insight, showing that knowledge of self-monitoring and hyperglycemia management was often satisfactory, suggesting that the gaps may lie more in theoretical understanding than in practical skills [22].

4.5. Factors Associated with Therapeutic Adherence

Therapeutic adherence in children with type 1 diabetes is essential for treatment success and complication prevention. This study identified several factors significantly associated with good adherence, many of which are supported by the literature.

Better adherence was observed among children aged 0 - 6, while adherence was poorer in those aged 7 - 12 and 13 - 18, similar to findings by Habteyohans *et al*. in Egypt. That study noted that preschoolers were less likely to have poor glycemic control, likely due to parental supervision, which ensured optimal adherence (85%) [23]. The 7 - 12 age group may be particularly vulnerable as they begin to gain autonomy without yet being mature enough to manage diabetes independently.

Socio-economic status was associated with adherence ($p > 0.05$), with a trend toward better adherence among modest-income families compared to low-income ones. This may reflect greater household stability or more consistent access to

transport and medical appointments. These results align with Niba *et al*. in Cameroon [15]. The provision of free insulin and glucose monitoring supplies through the CDiC project may have mitigated the typical impact of socio-economic hardship on adherence.

No correlation was found between caregiver education level and adherence. This may be due to the fact that 63.5% of children managed their care independently. This contrasts with findings from Dehiol *et al*. in Iraq, where maternal education was a key determinant of adherence [18]. This highlights the influence of cultural and contextual factors.

Children who performed 2 - 3 daily glucose checks had better adherence than those performing only one, echoing results from Niba *et al*., where 80% of patients with at least 3 checks per day were more adherent [15]. Thus, the frequency of glucose monitoring appears to be a predictive factor of adherence.

Glycated hemoglobin (HbA1c), as a reflection of adherence, showed that children with HbA1c < 8% were 42.4 times more likely to be adherent. This confirms the validity of using the Morisky-Green-Levine scale in our study. These findings support the conclusions of Elhenawy *et al*. in Egypt, who validated this tool for measuring insulin adherence in children [12].

Knowledge level was also associated with good adherence, as shown in our study and in that of Geneti *et al*., where well-informed adolescents were nine times more likely to adhere to self-management protocols [21]. This may be because informed patients better understand the consequences of non-adherence, adapt more easily to treatment changes, and have greater confidence in managing their condition.

Other factors such as psycho-emotional well-being, disease acceptance, belief in treatment efficacy, and social support were also linked to adherence. This was similarly observed by Gonzalez *et al*., who emphasized that emotional factors (e.g., disease acceptance) and social context (e.g., family support) were key predictors of adherence in pediatric diabetes [12] [24]. Specific and feasible psychosocial interventions (e.g., structured peer-support programs, family therapy, or motivational interviewing) could be implemented in this context based on these findings to improve treatment adherence and compliance, particularly among adolescents. Baron *et al*. reported that adherence could be enhanced through therapeutic education and support for both the patient and their family. The goal is to help individuals acquire and maintain the skills necessary to optimally manage life with diabetes, while progressively developing self-care autonomy. This involves establishing realistic, shared treatment and adherence objectives that are discussed and negotiated between healthcare providers and patients—constituting what is referred to as a therapeutic alliance [25].

5. Conclusion

The management of type 1 diabetes in children and adolescents followed at the Teaching Hospital of Treichville reveals a complex situation, characterized by overall inadequate glycemic control, low levels of diabetes-related knowledge, and signif-

icant challenges in therapeutic adherence. Adherence was influenced more by psychosocial factors—such as disease acceptance and trust in treatment—than by material constraints. These findings advocate for a holistic approach to care, integrating psychological support alongside medical protocols, in order to optimize therapeutic and educational strategies.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Wherrett, D., Huot, C., Mitchell, B. and Pacaud, D. (2013) Le diabète de type 1 chez les enfants et les adolescents. *Canadian Journal of Diabetes*, **37**, S531-S541. https://doi.org/10.1016/j.jcjd.2013.07.049

[2] Guilmin-Crépon, S. and Reynaud, R. (2020) Le diabète de type 1 en pédiatrie: Un point de vue épidémiologique et de santé publique. *Médecine des Maladies Métaboliques*, **14**, 383-390.

[3] Mayer-Davis, E.J., Kahkoska, A.R., Jefferies, C., Dabelea, D., Balde, N., Gong, C.X., *et al*. (2018) ISPAD Clinical Practice Consensus Guidelines 2018: Definition, Epidemiology, and Classification of Diabetes in Children and Adolescents. *Pediatric Diabetes*, **19**, 7-19. https://doi.org/10.1111/pedi.12773

[4] OMS (2022) La Région africaine en tête des diabètes non diagnostiqués, selon une analyse de l'OMS. https://www.afro.who.int/fr/news/la-region-africaine-en-tete-des-diabetes-non-diagnostiques-selon-une-analyse-de-loms

[5] Lokrou, A., Adoueny, V.K. and Timite-Konan, M. (1995) Le diabète de l'enfant de de l'adolescent en Côte-d'Ivoire. https://www.semanticscholar.org/paper/Le-diab%C3%A8te-de-l'enfant-de-de-l'adolescent-en-Lokrou-Adoueny/6298fa5b19d67a57138bd131fb917e80622d104a#citing-papers

[6] Graça Pereira, M., Berg-Cross, L., Almeida, P. and Cunha Machado, J. (2008) Impact of Family Environment and Support on Adherence, Metabolic Control, and Quality of Life in Adolescents with Diabetes. *International Journal of Behavioral Medicine*, **15**, 187-193. https://doi.org/10.1080/10705500802222436

[7] Alvin, P. (2000) L'adolescent et l'observance au traitement. *Journal de Pédiatrie et de Puériculture*, **13**, 225-229. https://doi.org/10.1016/s0987-7983(00)80087-0

[8] Bassam, S.E.A. (2019) The Relationship between Compliance and Quality of Life among Adolescents with Diabetes Mellitus Type 1. *American Journal of Nursing Research*, **7**, 1057-1068.

[9] Boiro, D., Sow, A., Ndongo, A.A., Basse, I., Thiam, L., Seck, N., *et al*. (2022) Assessment of Insulin Therapy in 281 Children and Adolescents with Type 1 Diabetes in Senegal. *Open Journal of Pediatrics*, **12**, 283-292. https://doi.org/10.4236/ojped.2022.121031

[10] Enquete sur le Niveau de vie des Menages en Cote d'Ivoire (Env 2015). https://www.ins.ci/templates/docss/env2015.pdf

[11] Schmitt, A., Reimer, A., Hermanns, N., Huber, J., Ehrmann, D., Schall, S., *et al*. (2016) Assessing Diabetes Self-Management with the Diabetes Self-Management Questionnaire (DSMQ) Can Help Analyse Behavioural Problems Related to Reduced Glycae-

mic Control. *PLOS ONE*, **11**, e0150774.
https://doi.org/10.1371/journal.pone.0150774

[12] Elhenawy, Y.I., Abdelmageed, R.I., Zaafar, D.K. and Abdelaziz, A.W. (2022) Adherence to Insulin Therapy among Children with Type 1 Diabetes: Reliability and Validity of the Arabic Version of the 4-Item Morisky Medication Adherence Scale. *Patient Preference and Adherence*, **16**, 1415-1421. https://doi.org/10.2147/ppa.s341061

[13] Massi Idrissa, A.W., Yao, A., Sanogo, M., Koffi-Dago, P., Hue, A., Danho, J., *et al*. (2022) Aspects Épidémiologiques des Enfants Diabétiques Perdus de Vue à Abidjan. *Health Sciences and Disease*, **24**, 43-46.

[14] Ngwiri, T., Were, F., Predieri, B., Ngugi, P. and Iughetti, L. (2015) Glycemic Control in Kenyan Children and Adolescents with Type 1 Diabetes Mellitus. *International Journal of Endocrinology*, **2015**, Article ID: 761759. https://doi.org/10.1155/2015/761759

[15] Niba, L.L., Aulinger, B., Mbacham, W.F. and Parhofer, K.G. (2017) Predictors of Glucose Control in Children and Adolescents with Type 1 Diabetes: Results of a Cross-Sectional Study in Cameroon. *BMC Research Notes*, **10**, Article No. 207.
https://doi.org/10.1186/s13104-017-2534-8

[16] Kyokunzire, C. and Matovu, N. (2018) Factors Associated with Adherence to Diabetes Care Recommendations among Children and Adolescents with Type 1 Diabetes: A Facility-Based Study in Two Urban Diabetes Clinics in Uganda. *Diabetes, Metabolic Syndrome and Obesity*: *Targets and Therapy*, **11**, 93-104.
https://doi.org/10.2147/dmso.s156858

[17] Noyerie, M.A. (2022) Facteurs prédictifs de déséquilibre de diabète de type 1 à un an: Description d'une cohorte pédiatrique nantaise.
https://dumas.ccsd.cnrs.fr/dumas-03659825v1/document

[18] Dehiol, R.K., Al-Asadi, G.M.A. and Alattabi, M.A.C. (2019) Factors Associated with Uncontrolled Type 1 Diabetes Mellitus in Children and Adolescents in ThiQar 2016-2017. *Thi-Qar Medical journal*, **18**, 144-158.

[19] Djonou, C., Tankeu, A.T., Dehayem, M.Y., Tcheutchoua, D.N., Mbanya, J.C. and Sobngwi, E. (2019) Glycemic Control and Correlates in a Group of Sub Saharan Type 1 Diabetes Adolescents. *BMC Research Notes*, **12**, Article No. 50.
https://doi.org/10.1186/s13104-019-4054-1

[20] Darwish, A. (2019) Compliance with Therapeutic Regimen among Children Having Type 1 Diabetes Mellitus. *IOSR Journal of Nursing and Health Science*, **8**, 17-26.

[21] Geneti, Y., Desta, K., Adimasu, M., Deressa, D., Aga, F., Lami, M., *et al*. (2022) Adherence to Diabetes Self-Management and Its Associated Factors among Adolescents Living with Type 1 Diabetes at Public Hospitals in Addis Ababa, Ethiopia: A Cross-Sectional Study. *Diabetes, Metabolic Syndrome and Obesity*: *Targets and Therapy*, **15**, 659-670.
https://doi.org/10.2147/dmso.s350168

[22] Owusu, B.A., Ofori-Boateng, P., Forbes, A. and Doku, D.T. (2022) Knowledge of Young People Living with Type 1 Diabetes and Their Caregivers about Its Management. *Nursing Open*, **10**, 2426-2438. https://doi.org/10.1002/nop2.1498

[23] Habteyohans, B.D., Hailu, B.S., Meseret, F., Mohammed, A., Berhanu, Y., Alemu, A., *et al*. (2023) Poor Glycemic Control and Its Associated Factors among Children with Type 1 Diabetes Mellitus in Harar, Eastern Ethiopia: A Cross-Sectional Study. *BMC Endocrine Disorders*, **23**, Article No. 208.
https://doi.org/10.1186/s12902-023-01453-9

[24] Gonzalez, J.S., Tanenbaum, M.L. and Commissariat, P.V. (2016) Psychosocial Factors in Medication Adherence and Diabetes Self-Management: Implications for Research

and Practice. *American Psychologist*, **71**, 539-551. https://doi.org/10.1037/a0040388

[25] Baron, S., Caquard, M., Caldagues, E. and Hazart, I. (2017) Therapeutic Adherence in Childhood and Adolescent Diabetes. *MT Pédiatrics*, **20**, 30-37.