



# Knowledge of type 2 diabetic patients followed for less than 5 years in primary care in the western region of Reunion Island: a cross-sectional pilot study

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## ABSTRACT

**Background:** The learning needs of newly diagnosed diabetic patients followed up in medical offices in Reunion Island are unknown, although necessary for the improvement of education programmes and disease control.

**Aim:** To assess the knowledge of type 2 diabetic patients in primary care followed for less than 5 years.

**Method:** A cross-sectional study was carried out, using a self-questionnaire to assess patients' knowledge of diabetes, complications, follow-up, diet and physical activity. Patients were recruited from medical offices in the western region of Reunion Island.

**Results:** From 23<sup>rd</sup> April to 31<sup>st</sup> July 2021, 89 patients were included. The knowledge level of the total sample was moderate (mean correct answers 65 % ± 17). The best knowledge levels were in the areas “generalities on diabetes” and “complications”, while the lowest levels were in the categories “follow-up” and “diet and physical activity”. Glycated haemoglobin, libido disorders, frequency of urinalysis and dental consultation, and the recommended diet for patients with diabetes which is the same as for the general population, were the least known concepts.

**Conclusion:** This study revealed gaps in patients' knowledge that could be used to improve education programmes which in turn could reduce or prevent diabetes complications.

## 1. Introduction

Type 2 diabetes is a chronic progressive disease with complications that can lead to disability or premature death. In 2014, there were 422 million people with diabetes worldwide, representing a prevalence of 8.5 % in the adult population. This number is increasing in all countries, making it a real burden on health systems [1]. This raises the need to improve diabetes care. Thus, identifying the learning needs of patients is an important step in revealing gaps in their knowledge. Various studies have shown that diabetes patients' knowledge about the disease, treatment, diet and physical activity is necessary for diabetes self-management. Indeed, an improvement in the level of knowledge about diabetes management, particularly through therapeutic patient education (TPE), was associated with better adherence to dietary advice, drug treatment, medical follow-up and better glycaemic control [2-10]. TPE enables « patients to acquire and maintain abilities that allow them to optimally manage their lives

with their disease ». It aims to « help patients and their families understand the disease and the treatment, cooperate with health care providers, live healthily, and maintain or improve their quality of life » [11]. However, TPE is still an underused tool in the fight against diabetes [7].

Located in the Indian Ocean, Reunion Island has a multi-ethnic, culturally and religiously diverse population, living a modern western lifestyle [12]. It is the French department most affected by diabetes: 8 % of the population was affected in 2019 [13,14]. In the midst of an epidemiological transition, with an increase in sedentary lifestyles and obesity, the morbidity and mortality attributable to diabetes are higher than in metropolitan France, with four times more premature deaths [14,15]. The national health insurance system considers diabetes to be a long-term condition allowing 100 % reimbursement of care and treatment related to the disease. In Reunion, most type 2 diabetic patients are followed exclusively by their general practitioner (GP). Indeed, health establishments and specialist doctors other than GPs cannot bear the burden of diabetes on their own [12].

*Abbreviations:* TPE, Therapeutic Patient Education; GP, General practitioner; HAS, Haute Autorité de santé; ASALEE, Action de santé libérale en équipe; BMI, Body Mass Index; HbA1c, Glycated haemoglobin.

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One local study revealed a low level of knowledge about the complications of diabetes in patients hospitalised for amputation with a mean age of the disease of 15 years [16]. Despite the creation of the first primary care TPE program in Reunion in 2003, patients with diabetes associated the hospital as the reference for TPE in a 2009 study [17]. In some doctors' and nurses' practices in Reunion, a 2008 study showed that real TPE activities were almost non-existent due to numerous obstacles to its implementation [18]. In a context of progressive deployment of outpatient TPE in primary care on the island, unknown proportion of patient who had experienced TPE and unknown learning needs of patients, a basic assessment of the knowledge of type 2 diabetic subjects is necessary to best adapt education programmes. Therefore, we conducted a pilot study whose primary objective was to describe the knowledge of type 2 diabetic patients in primary care followed for less than 5 years on diabetes, complications, follow-up, diet and physical activity. The secondary objective was to measure the influence of ambulatory TPE on patients' knowledge.

## 2. Method

### 2.1. Study design and participants

We conducted an observational, descriptive, cross-sectional study for 3 months. Patients were recruited if they met the following criteria: age at least 18 years, type 2 diabetes diagnosed for less than 5 years according to the *Haute Autorité de santé* (HAS) criteria [19], no insulin treatment, subject followed up in primary care. Patients were excluded if they were minors or adults under guardianship, illiterate or did not understand French, had cognitive disorders, or diabetes other than type 2, or if they had received TPE for diabetes in hospital (hospitalised in diabetes department).

### 2.2. Data collection

Patients were included in the study via their GP or TPE network nurse: *Action de santé libérale en équipe* (ASALEE). The nurses in this network have received 40 hours of training in TPE and provide it in the medical offices in individual or group sessions. The directory was used to contact by telephone, the 5 nurses of the ASALEE network and 134 of the 226 GPs in the western region of the island. Physicians were recruited on a voluntary basis, with the aim of obtaining at least one subscription per commune and according to the place of practice (the upper and lower areas of the island). During the study, several phone calls and e-mail follow-ups were carried out with the participating physicians and nurses.

For this observational research using an anonymous questionnaire, only oral consent from the patient was required without the need for written consent. Participants were informed of their right to refuse to participate in the study or to withdraw at any time, without justification. A registration with the data protection officer of the University of La Réunion was carried out. A declaration to the *Commission nationale de l'informatique et des libertés* was made (n°zCZ2813708t).

### 2.3. Instrument development

An anonymous 30-item self-assessed questionnaire in French was developed for the study (Appendix A). Some items from questionnaires validated in English were integrated and translated into French: Revised Michigan Diabetes Knowledge Scale, the Diabetes Knowledge Scales and the Patient's Diabetes Knowledge Questionnaire [20-22]. The other items were developed using the HAS recommendations and surveys from Reunion [19,23,24].

The form was divided into 5 parts: "characteristics" of the patient in 10 items; "generalities" about diabetes in 5 items; "complications" in 5 items; "follow-up" in 5 items; "diet and physical activity" in 5 items. The 30 items used were single response, open or closed questions in the form of "true/false/don't know" propositions. The scoring method was arbitrary: a correct answer was worth 1 point, an incorrect answer or ticking the "I don't know" box was worth 0 points. The higher the score reflects more knowledge.

Apart from the topic "patient characteristics", the other 4 dimensions of the questionnaire could be scored from 0 to 5 for a final score ranging from 0 to 20. The scoring method was as follows: a score < 12 (< 60 % correct answers) was considered "poor", a score between 12 and 15 (between 60 and 80 % correct answers) as "moderate", a score  $\geq 16$  ( $\geq 80$  % correct answers) as "good" [25,26]. In case of an incomplete questionnaire, an arbitrary threshold of one third non-response resulted in exclusion from the analysis. The management of missing data was carried out according to the maximum bias hypothesis: in case of non-response, the item "I don't know" was considered.

The questionnaire was pre-tested on a sample of 10 patients from the diabetes department of the *Centre Hospitalier Ouest Réunion*, not included in the study. Face and content validity were assessed by a focus group of specialists and patient experts from Dr. Gatina's department and the University Department of General Medicine. Included patients were classified into two groups: a group without TPE (patients followed by a GP and/or diabetologist) and a group with TPE (patients followed by a GP and/or diabetologist and having benefited therapeutic education programme in primary care). All patients included by the ASALEE nurses were included in the group with TPE.

### 2.4. Data analysis

The data from each questionnaire was transcribed into a Microsoft Excel® version 2110 spreadsheet and statistical tests were performed using the BiostaTGV tool.

Quantitative variables were expressed as mean and standard deviation in the case of a symmetrical distribution, and median, first and third quartile in the opposite case. The mean score was calculated by dividing the total score by the maximum possible score, multiplied by 100. Qualitative variables and some discrete quantitative variables with very few modalities were expressed as numbers and percentages.

For bivariate analysis, independence between a qualitative and a quantitative variable was tested using the Wilcoxon-Mann-Whitney test due to a non-normal distribution of some variables. A  $p < 0.05$  was considered statistically significant.

## 3. Results

Eighteen GPs and 2 nurses recruited at least one patient. At least one form was obtained in all communes, in rural or urban areas of the West Reunion region, except in the rural areas of one commune. The focus group state that the measurement tool had good face validity and the content validity has been assessed as "satisfactory".

From 23<sup>rd</sup> April to 31<sup>st</sup> July 2021, 104 questionnaires were collected and 89 (86 %) of them were included in the analysis. Fifteen (14 %) questionnaires were excluded: 7 patients had been diagnosed with diabetes for more than 5 years, 7 patients had been previously hospitalised in diabetology department, and one patient had gestational diabetes (Fig. 1).

Of the 89 eligible questionnaires, 12 (13 %) were incomplete but all had a non-response rate of less than one third. All incomplete questionnaires were analysed. One patient did not give an answer as to whether he was being followed by a TPE programme, which prevented him from being classified in one of the two groups. One patient did not provide his height, which compromised the calculation of his body mass index (BMI). Two patients did not answer about their type of medical follow-up (GP with or without diabetologist). Four patients did not indicate the frequency of their medical follow-up.

Table 1 shows the characteristics of the sample. Thirteen (15 %) patients had received an outpatient TPE programme and 75 (84 %) had never received one. Of the patients in the group with TPE, 12 (92 %) were recruited by ASALEE nurses and one was recruited by a GP. Age stratification was as follows: 11 (12 %) subjects were under 45 years of age, 60 (67 %) subjects were between 45 and 64 years of age, 16 (18 %) subjects were between 65 and 74 years of age and 2 (2 %) subjects were over 75 years of age. The sex ratio of women to men was approximately 1.3. The

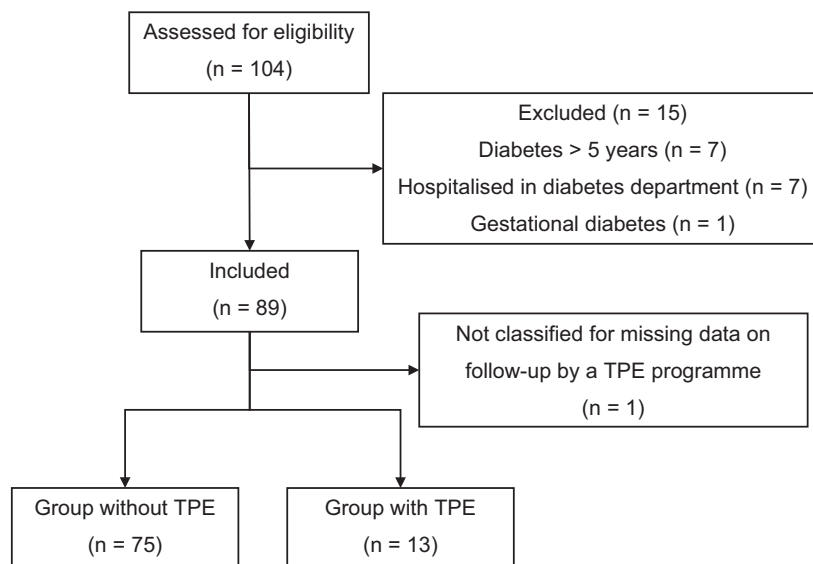


Fig. 1. Flow chart.

study population consisted mainly of overweight patients: 34 (38 %) subjects with a BMI between 25 and 29.99 kg/m<sup>2</sup> and 31 (35 %) subjects with a BMI greater than 30 kg/m<sup>2</sup>. The educational level of the total population was mainly represented by subjects without a diploma in primary education. The sample was mainly composed of employees and workers followed by unemployed and retired subjects. The mean age of diabetes was about 3 years.

The total population had a median score of 14 out of 20 and a mean score of 65 % correct answers. Medians and means were higher for “general” and “complications”, and lower for “follow-up” and “diet and physical activity” (Table 2).

The group without TPE had a median score of 13 out of 20 and a mean score of 63 % correct answers. The group with TPE had a median score of 16 and a mean score of 79 % correct answers. The Wilcoxon-Mann-Whitney test revealed statistically significant differences for the dimension’s “complications” ( $p = 0.004$ ) and “diet and physical activity” ( $p = 0.002$ ) between the groups without TPE and with TPE. The same non-parametric test also showed a statistically significant difference on the whole questionnaire ( $p < 0.001$ ) between the two groups (Table 3).

The knowledge level of the total population was described as “moderate” for 40 (45 %) patients, and “poor” for 25 (28 %) patients, while 24 (27 %) patients had a “good” knowledge level. The group without TPE had a predominantly “moderate” or “poor” level of knowledge while the group with TPE had a predominantly “good” or “moderate” level of knowledge (Table 4).

Table 5 shows the questions with the most incorrect answers. The knowledge deficits were apparent for questions relating to HbA1c (57 % correct answers), libido disorders as a possible complication of diabetes (48 % correct answers), frequency of urinalysis (17 % correct answers), frequency of visiting a dentist (45 % correct answers), recommended diet for patients with diabetes which is the same as for the general population (25 % correct answers). Regarding the frequency of urine analysis: 42 (47 %) subjects indicated the need for urine analysis every 3 months, 17 (19 %) subjects every 6 months, and 14 (16 %) did not know. Regarding the frequency of visiting a dentist: 21 (24 %) subjects indicated the need to visit every 6 months, 5 (6 %) subjects every year, and 21 (24 %) did not know. Details of the responses to each question from the total population, the group without TPE and the group with TPE, are available in Appendices B and C. In these supplementary data, the group with TPE had a higher response rate for questions on HbA1c, libido disorders, and recommended diet for people with diabetes, but a similar rate of correct responses for questions on frequency of urinalysis and dental visits.

## 4. Discussion and conclusion

### 4.1. Discussion

The results of this study revealed a “moderate” level of knowledge for these type 2 diabetic patients followed for less than 5 years in primary care. These data are similar to other studies conducted in Bangladesh, Jordan [25,27]. However, some studies have shown high [26,28] or low [4,8,16,29,30] levels of knowledge. These different results could vary due to the medical and demographic characteristics of the patients studied. However, it remains difficult to compare our study to others in terms of knowledge levels since each used different measurement instruments.

The studied knowledge concerned 4 dimensions: “general” about diabetes, “complications”, “follow-up”, “diet and physical activity”. In the analysis, participants had a lower level of knowledge in the categories of “follow-up” and “diet and physical activity”. According to our research, there do not appear to be any studies that have investigated patients’ knowledge of the frequencies of medical follow-up, although TPE has been shown to be effective in improving adherence to medical examinations [6,9]. This lower level of knowledge about diet and physical activity was also found in the literature [8,25,28,29]. These results revealed the need to increase patients’ knowledge of follow-up, diet and physical activity to reduce the morbidity and mortality associated with type 2 diabetes.

Our study revealed gaps in patients’ knowledge, particularly regarding HbA1c and the recommended diet for people with diabetes, which was also found in a study conducted in Kuwait [29]. A lack of knowledge has also been highlighted regarding libido disorders, a potentially forgotten topic, which patients should be informed about given the high prevalence of this complication [31]. Two other gaps were revealed: the frequency of urinalysis and the frequency of visiting a dentist. In 2019, these two examinations did not meet the monitoring targets in Reunion and in metropolitan France [14]. These main gaps identified should be the target of TPE programmes.

The secondary objective of this study was to measure the influence of ambulatory TPE on patients’ knowledge. The group without TPE and the group with TPE have different sample size without any epidemiological data being found in the local context. It was possible that only a small proportion of patients with diabetes benefit from TPE in primary care. However, this study showed a better level of knowledge in the group with TPE with statistically significant differences ( $p < 0.05$ ) on the whole questionnaire as well as on the dimension’s “complications” and “diet and physical activity”. This usefulness of TPE delivered by a primary care nurse has been supported by other studies [3,6,32]. These secondary results seem to

**Table 1**  
Sample characteristics.

	Total population (n = 89)	Group without TPE (n = 75)	Group with TPE (n = 13)
<b>Age* (years)</b>	56 ± 11	56 ± 11	59 ± 10
<b>Sex female/male**</b>	51/38	43/32	8/5
<b>BMI (kg/m<sup>2</sup>)*</b>	29 ± 7	29 ± 7	30 ± 5
<b>Educational level**</b>			
Primary school	34 (38)	27 (36)	7 (54)
Secondary and diploma	26 (29)	21 (28)	4 (31)
Baccalaureate or more	17 (19)	15 (20)	2 (15)
Undetermined	12 (13)	12 (16)	0 (0)
<b>Occupation**</b>			
Managers and entrepreneurs	5 (6)	5 (7)	0 (0)
Employees	33 (37)	26 (35)	7 (54)
Retired	19 (21)	16 (21)	3 (23)
Unemployed	32 (36)	28 (37)	3 (23)
<b>Diabetes duration**</b>			
Less than 1 year	21 (24)	12 (16)	9 (69)
Between 1 and 2 years	17 (19)	15 (20)	1 (8)
Between 2 and 3 years	15 (17)	14 (19)	1 (8)
Between 3 and 4 years	15 (17)	15 (20)	0 (0)
Between 4 and 5 years	21 (24)	19 (25)	2 (15)
<b>Diabetes follow-up **</b>			
GP only	78 (88)	67 (89)	11 (85)
Diabetologist and GP	9 (10)	6 (8)	2 (15)
<b>Frequency of medical follow-up**</b>			
Every month	30 (34)	27 (36)	3 (23)
Every 3 months	51 (57)	42 (56)	9 (69)
Every 6 months	2 (2)	1 (1)	1 (8)
Once a year or less	2 (2)	2 (3)	0 (0)
<b>HbA1c**</b>			
< 7 %	30 (34)	24 (32)	6 (46)
Between 7 et 7.99 %	16 (18)	15 (20)	1 (8)
Between 8 et 8.99 %	2 (2)	2 (3)	0 (0)
≥ 9 %	4 (4)	4 (5)	0 (0)
Unknown	37 (42)	30 (40)	6 (46)
<b>Number of TPE sessions conducted **</b>			
0 to 4 sessions	–	–	7 (54)
5 to 8 sessions	–	–	5 (38)
At least 9 sessions	–	–	1 (8)
<b>Duration of TPE follow-up**</b>			
Less than 1 year	–	–	13 (100)

Abbreviation: BMI, body mass index.

\* Mean ± standard deviation.

\*\* Number and percentage.

support the effectiveness of TPE in improving patients' knowledge, and therefore better adherence to dietary advice for better glycaemic control [2,5,6,8,30]. It is therefore a priority that TPE programmes in primary care are developed in Reunion Island. These education programmes should be based on an analysis of the health literacy profiles of type 2 diabetic patients in Reunion [33].

**Table 2**  
Knowledge levels for the total population for each dimension (n = 89).

Knowledge areas	Score interval	Median	Interquartile range	M (%) ± SD*
General <sup>♦</sup>	0–5	4	3–5	73 ± 26
Complications <sup>♦</sup>	0–5	4	3–5	71 ± 28
Follow-up <sup>Δ</sup>	0–5	3	2–4	58 ± 23
Diet and physical activity <sup>Δ</sup>	0–5	3	2–4	60 ± 22
<b>Total<sup>♦</sup></b>	3–19	14	10–16	65 ± 17

\* M (%) = Mean Percentage; SD = Standard Deviation.

♦ Quantitative variable with a non-normal distribution

Δ quantitative variable with a normal distribution

Regarding the demographic characteristics of this study, a majority of participants aged 45 to 64 years were recruited, as in other studies [3-5,8,10,15,25,27-30,34]. On the other hand, there was an overrepresentation of women in our sample, in agreement with the epidemiological specificities of Reunion Island and other studies [14,15,27-30,35]. The participants were mainly overweight, which has been found in previous studies [5,8,34]. Most subjects were followed up only by their general practitioner at least every 3 months: this regular follow-up was a predictive factor for participation in TPE in a Canadian study [9]. However, most patients in the group with TPE were recruited by ASALEE nurses, suggesting potential barriers to access to these programmes. Thus, other studies have suggested that education programmes should be better promoted to encourage uptake of these services [9,30] This study was mainly composed of employees, workers and unemployed also found in previous studies [16,27,30,34]. This was representative of the local socio-professional demography [35]. Furthermore, the participants had a low level of education as in other local and foreign studies [3-5,8,12,16,27,29,30]. Several studies have shown that higher levels of education are associated with higher levels of knowledge [4,5,25,26,28-30]. These results have shown that it is crucial for health professionals and education programmes to target these low-education populations to reduce diabetes-related morbidity and mortality.

Regarding the method of this study, we chose to include participants followed-up only in primary care for three reasons. First, most of patients with type 2 diabetes in Reunion are followed in primary care [12]. Secondly, patients hospitalised in a diabetes department systematically receive TPE in Réunion, as the hospital was considered the reference for TPE. [17,36]. Third, TPE programmes in primary care on Reunion Island have been developing since 2003, whereas actual TPE activities in nurses' practices and general practitioners' practices are reportedly minor [18]. Furthermore, we chose to include patients with diabetes diagnosed less than 5 years ago to obtain a homogeneous population and because TPE is more favourable to recently diagnosed patients [37]. In this study, ethnicity has not been included in this report due to French law limiting the use of ethnic elements in population censuses and surveys [38]. In addition, validated questionnaires on diabetes knowledge are available in English but none exists in French. We have chosen to develop a specific 30-item questionnaire, to adapt to the French and Reunionese context, particularly regarding dietary habits and follow-up of the disease. Concerning dietary habits, people in Reunion often eat too much rice and grains, which was mentioned in the questionnaire [23]. Moreover, validated questionnaires do not address diabetes follow-up according to the HAS recommendations used in France. Knowledge about disease follow-up is an innovative field of knowledge, not yet explored in the literature. The HAS recommends an HbA1c measurement every 3 to 6 months, an annual albuminuria measurement, an annual consultation with a cardiologist and a dentist, and a consultation every year or two with an ophthalmologist, depending on the balance of the diabetes [19].

This study has several limitations. On the one hand, we studied a level of knowledge, without attitudes or practices. On the other hand, the assessment of knowledge was carried out according to a questionnaire specially designed for this study and whose validity remains to be determined. Furthermore, our study contains selection biases: the non-inclusion of illiterate patients, even though the local illiteracy rate in 2011 was about 23 % of people aged 16 to 65 who have attended school in France [39]; recruitment of patients by professionals on a voluntary basis, which is responsible for the non-representativeness of the sample; a short recruitment period, which is responsible for a small number of patients; and the recruitment of patients in the group with TPE almost exclusively from the ASALEE nursing network, which is not representative of all TPE programmes in Reunion. This study also notes classification biases: the use of closed questions which may encourage adherence but provoke induced responses; the absence of a Creole translator in the event that the Creole-speaking respondents did not understand the questions; the declaration by the patients of their weight, height and HbA1c. A calculation of BMI was carried out although according to several studies, it is waist circumference that is predictive of insulin resistance [15,40].



**Table 3**  
Knowledge levels for the group without TPE and the group with TPE for each dimension.

Knowledge areas	Group without TPE (n = 75)				Group with TPE (n = 13)				p
	Score interval	Median	Interquartile range	M (%) ± SD*	Score interval	Median	Interquartile range	M (%) ± SD*	
General <sup>⊙,†</sup>	0–5	4	3–5	71 ± 26	2–5	4	4–5	82 ± 22	0.170
Complications <sup>⊙,†</sup>	0–5	3	2–5	67 ± 29	3–5	5	4–5	91 ± 16	0.004
Follow-up <sup>Δ,†</sup>	0–5	3	2–4	57 ± 22	1–5	3	3–4	68 ± 19	0.074
Diet and physical activity <sup>Δ,□</sup>	0–5	3	2–3,5	57 ± 21	2–5	4	4–5	77 ± 18	0.002
<b>Total</b> <sup>⊙,□</sup>	3–18	13	10–15	63 ± 17	10–19	16	15–18	79 ± 13	< 0.001

⊙ Group without TPE: quantitative variable with a non-normal distribution.

Δ Group without TPE: quantitative variable with a normal distribution.

† Group with TPE: quantitative variable with a non-normal distribution.

□ Group with TPE: quantitative variable with a normal distribution.

\* M (%) = Mean Percentage; SD = Standard Deviation.

**Table 4**  
Grading of knowledge levels for each dimension.<sup>#</sup>

Knowledge areas	Total population (n, %)			Group without TPE (n, %)			Group with TPE (n, %)		
	Poor	Moderate	Good	Poor	Moderate	Good	Poor	Moderate	Good
General	14 (16)	19 (21)	56 (63)	12 (16)	18 (24)	45 (60)	2 (15)	1 (8)	10 (77)
Complications	20 (22)	23 (26)	46 (52)	20 (27)	21 (28)	34 (45)	0 (0)	2 (15)	11 (85)
Follow-up	30 (34)	31 (35)	28 (31)	28 (37)	25 (33)	22 (29)	1 (8)	6 (46)	6 (46)
Diet and physical activity	26 (29)	35 (39)	28 (31)	24 (32)	32 (43)	19 (25)	1 (8)	3 (23)	9 (69)
<b>Total</b>	25 (28)	40 (45)	24 (27)	24 (32)	35 (47)	16 (21)	1 (8)	4 (31)	8 (62)

<sup>#</sup> Scoring method: a score < 60 % correct answers corresponded to a “poor” level, a score of 60-80 % correct answers indicated a “moderate” level, a score ≥ 80 % correct answers represented a “good” level.

A future study evaluating the knowledge, attitude, and practices of newly diagnosed diabetic outpatients, including illiterate subjects, through-out Reunion Island would provide more solid data on this subject. It would also be interesting to evaluate the proportion of patients with diabetes who have access to TPE in primary care in Reunion Island, and to identify any obstacles to this rapidly expanding system.

4.2. Innovation

This is the first study that investigated the yet unknown learning needs of patients with type 2 diabetes in the French department most affected by this disease, which is important to improve TPE programmes. As most patients with type 2 diabetes are followed exclusively by their GP in Reunion, it was important to focus on this outpatient population [12]. This study innovates by focusing on a particular population speaking two main languages: French and/or Reunion Creole. The latter is a regional spoken language, relatively close to French [41]. As French is the written

**Table 5**  
Questions with the most incorrect answers (correct answer rate < 60 %).

Items (correct answer in italic)	Incorrect (n, %)	No answer (n, %)
<i>Glycated haemoglobin (HbA1c) reflects blood sugar levels over the last 3 months.</i>	36 (41)	2 (2)
<i>Diabetes can reduce libido (sexual desire).</i>	46 (52)	0 (0)
It is necessary to do a urine analysis at least:	73 (82)	1 (1)
<input type="checkbox"/> Every 3 months		
<input type="checkbox"/> Every 6 months		
<input type="checkbox"/> Every year		
<input type="checkbox"/> I do not know		
It is necessary to consult a dentist at least:	47 (54)	1 (1)
<input type="checkbox"/> Every 6 months		
<input type="checkbox"/> Every year		
<input type="checkbox"/> Every 2 years		
<input type="checkbox"/> I do not know		
<i>The diabetes diet is a healthy diet for most people.</i>	66 (74)	1 (1)

language taught in schools in Reunion, the french questionnaire used in this study seemed adapted for the literate population studied [41].

Although it is a non-validated tool, this study provided a questionnaire that could quickly assess and improve the knowledge of patients with diabetes in Reunion, to reduce or prevent complications of the disease. To our knowledge, this is the first questionnaire in french that focused on patients' knowledge of type 2 diabetes follow-up, which could help to improve patient's follow-up, which is not yet the objective in metropolitan France nor in Reunion [14].

4.3. Conclusion

This pilot study revealed a “moderate” level of knowledge among newly diagnosed patients with type 2 diabetes in the western region of Reunion Island. Learning needs were identified, particularly regarding follow-up, diet and physical activity. These results could be of significant use in adapting TPE programmes to prevent and reduce complications of type 2 diabetes. Primary care health professionals should be trained to deliver TPE appropriate to the learning needs of patients, which could increase their knowledge and improve self-management of type 2 diabetes. A booklet responding to the study questionnaire is available in Appendix D, which can be used as a TPE aid.

Disclosures

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors declare no conflicts of interest. We confirm all patient/personal identifiers have been removed or disguised so the patient/person(s) described are not identifiable and cannot be identified through the details of the story.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pecinn.2023.100122>.

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