



Predictors of Good Metabolic Control of Diabetes in Adolescents Social, Epidemiological and Neuropsychological Dimensions

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Authors' contributions

This work was carried out in collaboration among all authors. Authors JZ, NEH, NB and ZI contributed to the drafting, literature search, proof reading and finalization of the write up of this case report. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Our study included 60 children with diabetes. We divided them into two groups: Group A and Group B. Patients assigned to Group A had controlled diabetes and formed our "Control Group", while Group B was for patients with poorly controlled diabetes. This study was conducted in « The Home of the Young Diabetic » center in collaboration with the diabetes unit at the pediatric hospital of Rabat. Our goal was to identify the different predictors of metabolic control in diabetic adolescents by looking at the epidemiological data, lifestyle, social level, and the family life of different categories. Finally, we analyzed the results and suggested solutions.

To improve the medical care of diabetes provide better control of the teenage period and reinforce therapeutic education, it is necessary to propose social help to families in need and expand the right of health insurance to all citizens but also refund all the new technologies in diabetes treatment. Lastly, we suggested the integration of a psychological test at the beginning of the diabetes discovery and add it to the screening of complications.

Keywords: Diabetes; glycated hemoglobin; insulin; psychological; social.

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1. INTRODUCTION

Type 1 diabetes is a chronic disease that occurs most often in childhood, adolescence, or early adulthood, and is rarely in older people. This type accounts for 10% of diabetes worldwide and requires excellent initial and ongoing management. [1]

To be able to control this disease, the patients must be vigilant about what they should do and what they should avoid, have a perfect understanding of the disease, and prioritize their health. These rules not only apply to young patients, but also to those around them.

In the majority of cases, the imbalance is due to poor family cohesion, an underprivileged socio-economic environment, associated with psychological or psychiatric disorders, or an adolescent crisis. All of these factors determine the ability to manage diabetes.

If patients with diabetes do not have access to means to improve their lifestyle, manage family conflicts and associated disorders, it is unlikely they will be able to achieve their glycemic objective of HbA1c <7%.

In this paper, we will therefore explore the impact of these factors on the follow-up of this disease through a retrospective study carried out at "The Home of the Young Diabetic" center in collaboration with the diabetology unit in the children hospital in Rabat .This study will also allow us to see whether the psycho-social and economic impact can play a role in diabetes control. Finally, we will propose possible solutions to avoid this imbalance.

2. MATERIALS AND METHODS

We conducted a retrospective study at "The Home of the Young Diabetic" center in collaboration with the diabetes unit of children's hospital in Rabat to explore the various predictors of a good diabetic metabolic control in diabetic adolescents, and to assess whether this control could be affected by psycho-social and economic impact factors. According to these findings, we made some recommendations to avoid this imbalance.

2.1 Study Aims

Our objectives were to study the predictors of metabolic control of diabetic children, compare

epidemiological data, lifestyles, social level, and family life of patients with unbalanced diabetes and patients with well-balanced diabetes and finally analyze the result of the study and propose solutions.

The selection of patients in the two groups was made through the database available at "The Home of the Young Diabetic" center. The collection of information on the files was done through an operating sheet. A psychological evaluation was explored through interviews with the center's psychologist. We used Numbers and Microsoft Excel software for statistical analysis.

We first went through the 2017 and 2018 Glycated hemoglobin registries, collecting the names and file numbers of the patients involved. This comparative study covers two groups:

- Patients with one or more Glycated hemoglobin lower or equal to 7% during 2017 and 2018 (Group A).
- Patients with one or more Glycated hemoglobin over or equal to 14% during the same period (Group B).

Once the names and file numbers were noted, we selected 79 patients with glycated hemoglobin greater than or equal to 14%.

In this selection, we have eliminated patients who are currently over 18 years old and patients who were diagnosed with Diabetes for less than 2 years.

We also excluded unusable files. Thirty patients met the study criteria. The selection of the control group was based on the number of cases and adapted inclusion criteria.

The following step was to go through the records of the archives through the file number and the first letter of the patient's name previously collected.

Then, with the help of the center's psychologist, we were able to complete the information about the psychological examination of the patients that were not in the archives.

3. RESULTS AND DISCUSSION

3.1 Diabetes and Adolescence

Thirty patients were selected in group A. Twelve of which were 13 years old or younger. and the

rest of the patients were adolescents. On the group B, two out of 30 patients were 13 years old or younger. The 28 remaining patients were adolescents.

Most of the cases in our study are in the period of adolescence. This phase is characterized by several changes, both physical and psychological. Although this phase is very destabilizing, it cannot be the only factor responsible for poor glycemic control. Out of 46 adolescents in both categories, twenty three patients had no psychological problems.

In a study [2] that evaluated the TCY ("taking care of yourself") which can be assessed in 3 parameters : physical health, psychosocial life, and adolescent illness. Significantly higher scores perceived of TCY were associated with a level of HbA1c \leq 7.5%.

3.1.1 Diabetes imbalance and its female predominance

There were 16 female and 14 male patients in Group A with a sex ratio (M/F) of 0.87. In Group B we had 21 female patients and 9 male patients, with a sex ratio (M/F) of 0.43 and a clear feminine predominance. One theory [3] assumes that there is an increase in blood glucose levels a few days before menstruation and a decrease during the first few days of menstruation.

3.1.2 The role of adolescents guardians in diagnosing and monitoring diabetes

Parental vigilance plays a very important role. A patient with caring parents is more likely to be quickly diagnosed. They are also more likely to be well balanced in the future. These parameters may be indicative of the attention that parents give to their diabetic child. In our

study we took 4 parameters to evaluate this dimension:

Diagnostic delay: (Graphic 1)

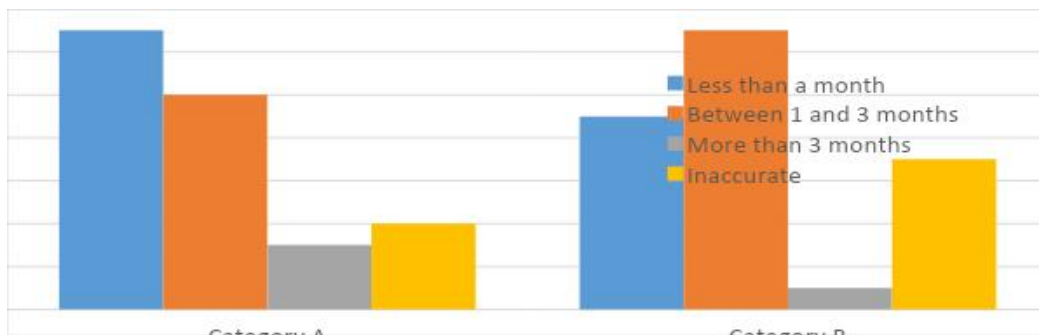
In group A, most patients were diagnosed in less than a month (13 patients). Ten between 1 and 3 months, three in more than 3 months, and 4 with undetermined time. In category B, the majority were diagnosed between 1 and 3 months(13 patients), nine in less than a month, one of the patients in more than 3 months, and 7 of the patients with inaccurate data.

3.1.3 Clinical signs on admission

We notice in the control group that most of the patients at the admission had signs of hyperglycemia only (50% of patients), 33.3% showed signs of Diabetic Ketoacidosis and none of the patients came in a coma state. On the other hand, in group B, we notice a predominance of diabetic Ketoacidosis with a percentage of 50%. A percentage of 43.33% came with signs of hyperglycemia only and 3,3 % in a coma.

3.1.4 Initial glycated hemoglobin

In group A, although most folders do not contain this information, the majority of the data explored, and more precisely, 6 patients out of 30 are in the range of 7% to 10%. Four patients with Glycated hemoglobin (HbA1c) lower than 7% and 4 others between 10% and 14%. No patients had initial glycated hemoglobin greater than 14%. Group B also had a high number of inaccurate data (14 patients).On the other hand, there is a clear predominance of patients who had between 10%, and 14% initial (12 patients), 1 single patient between 7% and 10% and 3 more than 14%. No patients in this category had an HbA1c of less than 7%.



Graphic 1. Diagnostic time in category A and B

3.1.5 BGM: Blood glucose meter

A percentage of 76% of patients in category A performed more than 4 blood glucose tests per day compared to 12% in category B.

In a study led by the Mental Health Unit, Joslin Diabetes Center, Harvard Medical School [4] they found that increased frequency of BGM (blood glucose meter) was associated with lower HbA1c levels. When the frequency of BGM was zero or once a day, the average HbA1c level was 9.9% +/- 0.44; When the frequency of BGM was two or three times a day, the average HbA1c level was 8.7% +/- 0.17; When the frequency of BGM was four or more times per day, the average HbA1c level was 8.3% +/- 0.22.

3.2 Precarity and Diabetes

3.2.1 Medical insurance

In group A, 24 patients benefited from health care. Only 6 people had no medical insurance. In group B, 2/3 had no medical insurance. For the remaining 1/3, 4 did not specify and 6 had one.

The marital status analysis of the parents showed in group A that all parents of the cases were married except one patient who lives in a charitable organization. In group B, all parents were married.

3.2.2 Schooling of mothers

In group A, illiterate mothers were rare with a percentage of 10%. Mothers with a high school diploma represented 33.3%. Mothers with secondary education or less are predominant with 36.6%. In the second group, there was a clear predominance of illiterate mothers with a percentage of 40%. 26.6% had secondary education or less, and only 3% had higher education.

3.2.3 Fathers schooling

For fathers of group A, only 6.6% were illiterate. Concerning group B, 16.6 were illiterate.

3.2.4 Children's schooling

All the children included in our study were schooled.

By assembling these parameters and analyzing them, the precariousness of the families of young

diabetic patients plays a key role in the imbalance of diabetes.

A study in the Pediatrics Department of the Delafontaine Hospital in Saint Denis [5] about four clinical cases that were observed and compared. All diabetic patients studied were followed and treated in the same department. They presented social and psychological difficulties and one of the patients had difficulties understanding the French language. 50% of the patients had a glycemic imbalance. The other 50% were well-balanced despite the precariousness: Their families were more cohesive and showed a lot of support for their diabetic children.

3.2.5 Diabetes and psychological disorders

In group A, no disturbances were reported on their files except for a single patient who had a psychiatric disorder before the diagnosis of his diabetes. In group B of our study, 22 patients had a psychological follow-up. There is a clear predominance of family conflicts (12 patients out of 22) including 10 patients suffering from parental neglect and 2 patients from family overprotection. Several diagnoses were made by the psychologist: Two patients suffered from depression, 9 were in an adolescent crisis, 10 were experiencing family conflicts, and 5 required psychiatric care. There were a few patients who present, at the same time, several of the diagnoses mentioned above.

3.2.6 Family conflict and its role in diabetes imbalance

Parental neglect and diabetes control were interlinked, an imbalance in diabetes produced family stress and family stress worsened diabetes control.

Two studies have been conducted in this regard:

*The survey of Viner and collab [6] was conducted on 43 children and adolescents and their mothers. The presence of family stress was strongly associated with poor glycemic control in children and adolescents.

* The Cross-sectional study conducted by duke et al.[7] showed the Family behavior measurement explained 11.8% of the variation in glycemic control. Youth who reported a critical parenting style to diabetes management had higher blood glucose levels.

3.3 Diabetes and Depression

Diabetes and depression is a very common association. It is double-edged, the patient is unbalanced, thinks about complications, and therefore enters into a state of depression that pushes him to eat poorly, to have poor self-control, and mismanage his diabetes. This is both a cause and a consequence of the imbalance. (Table 1).

3.3.1 The impact of psychiatric disorders in diabetic adolescents and/or their guardians on glycemic control

It should be noted that there are some several patients or parents who had psychiatric disorders that are as harmful as the above factors. Indeed, a patient with a psychiatric disorder cannot manage such a disease. In our study, the center does not have a psychiatrist, but 13% of the patients with psychological follow-up were referred to a psychiatrist outside the center.

A study conducted by Robert et al.[12] in a pediatric diabetology unit can confirm this statement. In this work, 104 (55%) of the patients had at least one psychiatric disorder: 33% had an anxiety disorder, 13% an affective disorder. HbA1c was higher among youth with at least one psychiatric disorder diagnosis (9.6% vs. 9.1%). HbA1c was higher with self-reported depression, and with both internalized and externalized disorders assessed by parents. Over the 5-year follow-up, 42% of the youth had at least one psychiatric disorder associated with a higher HbA1c. Diabetics with high HbA1c and psychiatric disorders had more complications.

3.4 Limits of Our Study

In our study the main limitation was in the archival and psychological files: Some files did not contain enough information.

This can be explained by the lack of psychological care of diabetic adolescents in our countries. There isn't a constant psychological follow-up.

3.5 Discussion of Solutions

At the issue of our study, the main difficulties of glycemic balance are during the transition to adolescence, socio-economic precariousness, and psychological and psychiatric disorders.

Several solutions are possible. Beginning with the period of adolescence. This transition must be prepared in the beginning, well explained, by professionals and also by parents especially to children who are diagnosed before the age of 13. For new adolescents with diabetes, meetings can be organized in the "home of the young diabetic" led by a psychologist where they can share their difficulties, support each other and challenge each other with rewards.

The adolescent is in the process of building their personality. The autonomy of the diabetic is paramount. In fact, in the study based on the evaluation of the "TCY"[2]described above, the autonomy of adolescents with HbA1c >9% is considered to be the obedience of the diabetic. While for adolescents with HbA1c<9%, they consider themselves autonomous only if they are capable of making their own decisions.

In addition to this, a recent study at the University of UT southwestern medical center[13] showed that pet adoption has a beneficial effect on diabetes management.

Indeed, the ability to care for their pets reflects the autonomy of the child/adolescent. It also allows the acquisition of discipline in various daily tasks.

The result of this work showed that the category that raised a pet had 0.5% lower glycemic index numbers than those that didn't raise one.

Also, studies [14],[15] showed that the introduction of an insulin pump significantly improves the quality of life of diabetic children and adolescents. The new systems for continuous glucose measurement are also very effective in balancing diabetes.

In Morocco, these devices are rare and are not covered by health insurance. This complicates their acquisition. By adopting facilities in this sense, we can improve the management of diabetics in difficulty.

Moreover, we should multiply the number of associations of young diabetic patients to benefit from economic support for those in a very precarious situation and to extend medical insurance's rights for all citizens.

We also need to involve, in addition to the parents, other family members who can improve the care (brothers, sisters, aunts...).

Table 1. Research papers about diabetes and depression [8] [9] [10] [11]

Studies	Type of study	Population	Country	Results
Fuller Thompson and Sawyer [8]	Observation	82675	Canada	Suicidal thoughts are 15% in type 1 diabetics
Han et al, 2013[9]	Observation	17065	Korea	Suicidal thoughts in 24,2% of diabetics 16,5% in non-diabetics
Myers et al,2013 [10]	Observation	145	USA	9, 2% attempted suicide. The majority of patients were diagnosed with depression
Bot et al,2013[11]	Observation	646	Netherlands	11% of diabetic patients had suicidal thoughts. 8,3% had type 1 diabetes and 13,2% had type 2 diabetes
Our study, 2020	Observation Case-witnesses	60	Morocco	30 patients in the control category had no psychological follow up. 23 patients in the case category had psychological follow-up, 9% of them had depression.

It is also necessary to consolidate social assistance. In the study which deals with the relationship between precariousness and diabetes[5], they essentially refer to social workers and the "family holding" in their intervention plan. Indeed, social workers have been a "facilitator" between the family, the medical team, the state social services, and the hospital pharmacy for the treatment of diabetes. The word "family holding" represents family support and care. This parameter weighs more than the material precariousness on the balance of diabetes.

Psychological disorders can be a cause or a consequence of glycemic imbalance. The goal is therefore to avoid the apparition of these disorders and to take care of them as soon as possible.

The initial assessment of diabetes should include a psychological examination and also the assessment of complications.

4. CONCLUSION

Type 1 diabetes is a global public health issue, with the rate of children diagnosed increasing each year. This type of diabetes most often occurs during childhood, adolescence, or early adulthood, making it more difficult to manage. In this study, the conclusion was that although diabetes is controlled through insulin injections, it is necessary to follow a good lifestyle and avoid high doses of treatment with a good diet and regular physical activity. But for this to be possible, psychological balance and a good socio-economic level are essential.

CONSENT

Informed verbal consent was taken from the parents of all children.

ETHICAL APPROVAL

The Ethics Committee has been informed that the study is about the evaluation of parent's knowledge about fever.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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