Original Research Article

Association between family dynamics and psychosocial supports on glycaemic controls of children with diabetes mellitus in Port Harcourt, Nigeria.

Abstract

Background:

Diabetes control in children is usually predicated by several factors such as availability of insulin, home or family dynamics, environmental stability and economic factors. Home or family dynamics such as marital status of parents, family income, conflicts in the family and home can lead to psychosocial stress and affect the level of care provided for the child living with diabetes.

Objective: To study the family dynamics and its effect on glycaemic control in children living with diabetes mellitus.

Design: A cohort observational study

Setting: All diabetes mellitus patients on follow up or admitted in the Paediatric department of the University of Port Harcourt Teaching Hospital between January to July 2022.

Subjects: Sixty-three children and care givers were interviewed in the clinic or ward,

Measurements: Using an interviewer administered questionnaire, the family dynamics and psychosocial supports were determined by a modified questionnaire previously validated by White et al. Glycaemic control was determined using the HbA1c done within the past 3 months. Analysis was done using IBM SPSS version 24 for Mac, $p < 0.05$ was regarded as significant.

Results:

Sixty-three patient-care giver pair were studied. Patients were aged 3 – 19 years, mean 12.98 ± 3.97 years and mean HbA1c was 11.13 ± 2.46%. Majority, 43 (67.4%) of children were living in two parents' family settings while the rest were single parenthood/ extended nuclear families, 20 (23.9%). Twenty-three (36.5%) were living in poor conditions with limited financial resources and 30 parents (47.6%) could not provide their parental functions adequately. Seven patients had 3 DKA episodes in past one year, and 5 of them were living with single parents or extended families. The mean HbA1c for children living in 2 parent setting was 10.51 ± 2.38%, as against 12.3 ± 2.25% for those in single parent/ nuclear setting, $t = 2.71$, $p = 0.009$. Good glycaemic control had weak positive correlations with caretaker type, satisfactory home environment and parental functioning.

Conclusion

Good glycaemic control is common with two-parent families and families with financial adequacy and satisfactory home environment. Helping families cope with social and psychological stresses may help improve glycaemic controls in children with diabetes.

Key words: unstable homes, glycaemic control, home environment, Nigeria

Introduction:

BACKGROUND: Type 1 diabetes (T1DM) is a common endocrine disease in children in Nigeria and the rest of the world. The metabolic controls are usually difficult to maintain over time in children and adults and this is usually based on individual personality, peculiarity and family environment. Measuring the haemoglobin A1c (HbA1c) is reliable standard of care for assessing long-term glycaemic control of patients with diabetes. The International Society for Paediatrics and Adolescents Diabetes (ISPAD) (1) targets HbA1c of 7.5% as treatment/ control goals of T1DM while the American Diabetes Association (ADA) recommend target values for HbA1c in relation to age as follows: HbA1c, 8.5% at δ 6 years, 8 % at 6 to 12 years, and 7.5% at 13 to 18 years if achieved without severe episodes of hypoglycaemia. (2) Achieving these controls in children with TIDM is dependent on increased frequency of testing, adequate insulin injections, proper diet, and stable home environment. The use of glucose sensors, self-blood glucose monitoring, and multiple doses of insulin are measures known to help achieve normal HbA1c but these are usually not achievable in sub-Saharan Africa.

Several studies have linked poor family /home dynamics and environments with poor glycaemic controls and increased frequency of diabetic keto acidosis in children. (3–5) The psychosocial factors that prevent good glycaemic controls have been recorded as family financial stresses, care-givers inability to function adequately, low family support and single parent/ extended family care. Many families have had to change their routines and diet to suit that one child that has diabetes and this puts strain on the other children in the family necessitating the need for psychologic care. (3–6) Though studies have been done in many developed countries highlighting the effects of home/family dynamics and environmental challenges of managing diabetes and getting them under control, there is none in one of the

most populous African countries, where there is increased poverty rate due to inflation, poor health system dynamics and out of pocket health care financing. (7–9)

OBJECTIVE: This study aims at highlighting the family dynamics and psychosocial support in families of children with diabetes in the University of Port Harcourt Teaching Hospital, Nigeria and the association with glycaemic control, if any.

Methods

Study design:

This is an observational cohort study of effect of the home/family dynamics and environment and some psychosocial characteristics on glycaemic control using HbA1c measurements of children with T1DM.

Setting: All diabetes mellitus patients on follow up or admitted in the Endocrinology unit of the Paediatrics department of the University of Port Harcourt Teaching Hospital between January to July 2022.

Subjects: All sixty-three children being managed in the endocrinology unit for diabetes and their care givers were interviewed in the clinic or ward. A child was eligible if s(he) was diagnosed with diabetes mellitus, has been on follow for over 3 months, was with a caregiver and had a recent HbA1c measurement.

Measurements: Using an interviewer administered questionnaire, the psychological and social factors were determined by a modified questionnaire previously validated by White et al. Glycaemic control was determined using the HbA1c done within the past 3 months. Analysis was done using IBM SPSS version 24 for Mac, $p < 0.05$ was regarded as significant.

Data was collected from January 2022 to July 2022. Data collected included gender, age at onset of diabetes, disease duration, and HbA1c levels within the past 3-6 months. The inclusion criteria were all the children on follow up and/or admitted for diabetes mellitus into the paediatric endocrinology unit. We used the strobe cross sectional reporting guideline for this article. (10)

HbA1c measurements

HbA1c was measured by ionic exchange high pressure liquid chromatography (HPLC) with the Biorad D10 (Biorad Laboratories Inc., Hercules, CA, USA) following the manufacturer's guidelines for methodology.

Psychosocial evaluations of the patients

During the clinic follow up, patients were interviewed using structured questionnaire to obtain information about their home and psychosocial environment by the principal investigator to minimise inter-interviewer variability. Each interview was completed within 10 - 20 minutes. Data collected included; the family type/primary care-givers, home environment, parental functioning, presence of family problems, family involvement in diabetes described by White et al (3), health insurance, insulin type and regimen and socioeconomic class using Ibadin et al. (11)

Family type/ caretakers were either two parents, or single parent / living in extended family care. **Home environment** was satisfactory living conditions, (where children were in comfortable housing, had regular meals, regular schooling and play time) or poor living conditions. **Family problems** in the home environment were described as unstable composition (young or inexperienced parent, without adequate family support), conflicts within families, unclear boundaries between generations. **Family involvement in diabetes** where family were classified as involved and encouraging sick role behaviours or uninvolved. The involved family is one in which members help give injections, check blood glucose, manage nutrition, set reminders of testing and injections or appointments with doctors. Some family members may not be completely involved but when the patient is ill, they encourage sick role behaviours. The adequate parental functioning is one with financial capacity, interest in the care of the patient, discipline and coping well despite challenges.

Bias:

Authors minimised biases in reporting from the parents/ caregivers and the patients by examining gestures, hesitations and conflicting reports from the interviewees. At such times, one of the pair was asked to leave the room and then the interview continued with the other. Afterwards, the other party was asked to return and the same questions were posed. If there is still inconsistency in the reports, the family is flagged and referred to the psychologist for

further counselling sessions. To reduce recall bias and inconsistencies, the interviewer made notes and asked the interviewee to return for another interview session within a week.

Statistical Analyses

Statistical analyses were performed using IBM SPSS version 24 (SAS institute Inc., Cary, NC, USA). The HbA1c of these children were subclassified into < 8.0% (good control) 8 – 10% (intermediate control) and >10.0% (poor control) following the ISPAD guidelines. (1) Sex differences in mean glycaemic controls and other variables were explored. The mean HbA1c of the psychosocial variables were compared using student t test or ANOVA (for multiple categories). The associations between good control and the psychosocial factors were analysed using Pearson's correlation test and logistic regression analyses, and $p < 0.05$ was set for statistical significance.

Ethical considerations

This study was approved by the ethics and research committee of the University of Port Harcourt Teaching Hospital and all child-parent unit gave informed verbal consent before interviews were conducted. Sensitive information were handled confidentially, and children who felt / reported being abused, were further sent to the psychologist and/or psychiatrist for further management.

Results

A summary of the demographic characteristics of the patients is presented in table 1. The mean age of children was 12.98 ± 3.97 (3 - 19) years, and there were 37 (58.7%) females and 26 (41.3%) males, $\chi^2 = 1.921$, $p = 0.166$. The mean duration of diabetes was 5.24 ± 3.18 years, range 0.4 – 9.62 years, and there were 56 (88.9%) children with TIDM and 6 (9.5%) with T2DM, and one neonatal diabetes. Only 11 (17.4%) families had any form of health insurance while the rest did not. Majority of the patients had poor glycaemic control; 5 (7.9%) had good control, 21 (33.3%) had intermediate control, while 37 (58.7%) had poor control.

Table 1: Mean scores of some demographic and clinical characteristics of patients with diabetes and differences between male and female subjects

	Male (N = 26)	Female (N = 37)	t test, p value
Age at interview	12.5	13.3	-0.81, 0.422
Duration of disease	5.45	5.10	0.424, 0.673
HbA1c	10.7	11.35	0.911, 0.366
Frequency of DKA in the last year	1.50	1.84	-1.83, 0.071
Insulin dose (IU/kg/day)	1.055	1.070	-1.063, 0.871

Though males had a lower average HbA1c than females, the difference was not significant.

Table 2: Some psychosocial characteristics of patients and the mean HbA1c compared across categories.

	HbA1c	t test/ F	p value
Caretakers Two parents 43 Single parents/ outside nuclear family 20	 10.56 ± 2.4 12.3 ± 2.2	7.39	0.009*
Home environment Satisfactory living conditions 41 Poor living conditions 22	 10.41 ± 2.2 12.45 ± 2.4	11.45	0.001*
Parental functioning Adequate 33 Inadequate 30	 10.5 ± 2.3 11.8 ± 2.5	4.72	0.034*
Family involvement Involved/ encouraging management 58 Uninvolved 2 Poorly understood 3	 10.9 ± 2.4 15.0 ± 2.4 13.3 ± 1.15	4.35	0.017*
Health insurance Public/private (11) No health insurance (52)	 10.22 ±1.98 11.31± 2.55	1.77	0.188
Insulin regimen Pre-mix/Free mix Basal Bolus	 10.9 ± 2.17 11.4 ± 2.7	0.84	0.436

Parenting was considered adequate when a child lived with both parents, or a single parent and gave care, provided every need, attended clinic appointments, made recordings of blood glucose and asked relevant questions to try to prevent sick days, or maintain good glycaemic

controls. These families had children with relatively better HbA1c. We find that most of the parents/care givers were involved in the management process of the patients even if they had difficulties with funds and provision of necessary needs for optimal glycaemic controls. In this study, a family can be involved in the care with all social and psychologic support but did not have the financial capacity for adequate care. Very few families were uninvolved or poorly understood diabetes, and these families also had children with better glycaemic controls. Some of these admitted to seeking alternative care, like faith-based healing or traditional medical practices, despite adequate diabetes education. However, when they noticed the patient was ill, they encouraged sick day behaviours including taking fluids, eating right and taking the insulin injections.

Table 3: logistic regression analysis of those significant factors associated with glycaemic control

Variable	Category	β	p value	Odds ratio	95% CI
Home environment	Poor living condition	-0.657	0.474	0.519	0.086 3.124
	Adequate living condition				
Parental functioning	Adequate	17.424	0.000*	369.7	67.4 201.7
	Inadequate				
Family involvements	Involved	-0.838	0.276	0.433	0.096 1.954
	Uninvolved				
Caretaker	2-parent setting	0.551	0.428	1.73	0.444 6.786

* p value <0.005, CI Confidence interval

The only independent predictor of good glycaemic control was parental functioning. The other social and psychological factors may have impact on the the glycaemic control, but these are not predictors.

Discussion

The mean HbA1c of our patients was relatively higher than those recommended by ISPAD and ADA for children and adolescents, indicating overall poor glycaemic control. This is also relatively higher than the means described by many authors in Osman et al (12) and Dehayem et al (13) in Africa but similar to the mean in Ogugua et al (14), Pastakin et al (15) and McClure et al. (16) The mean HbA1c was however lower than those of Elamin in Sudan, (17) and Lek in Laos (18). Only 7.1% of our patients had HbA1c < 8.0%, which is far less than what was achieved in Kenya by Ngwiri et al (19) and certainly less than those in many other

countries in the world. The common factor to all those with poor controls are limited economic resources for purchase and administration of insulin with reduced ability to test blood glucose as often as recommended by ISPAD and ADA.

Most of the social indices used to check home stability significantly impacted negatively on glycaemic control. Two-parent family units had children with relatively better glycaemic control than those living in single parent / with extended families. Even though two-parent families had children with better glycaemic controls, it is still advisable that they need to have close ties and bonds and understanding of the need for cohesion to achieve good glycaemic control. While studies have described single parenthood as dysfunctional and increasing the susceptibility to poor glycaemic controls, some two-parent families have also been reported to have challenges reaching optimal glycaemic goals. (7) These families have been described as rigid, chaotic and having communication issues. (20) So, while it may be generalised that two-parent families have better glycaemic controls, these situations should also be individualised to the particular patient and dealt with in their own merits. Siblings and parents have described psychosocial problems in such circumstances and the ADA has recommended family therapy if this significantly alters glycaemic control. (2, 21)

In any condition, possession of comprehensive health insurance may improve the health outcome of the patient including diabetes, (22) which is why many countries have made it mandatory that all citizens possess health insurance and why the Affordable care act was signed into law in the USA. However, in Nigeria, only a little over 5% of her citizens have health insurance, and most of these are in the Federal government service, as it is mandatory for civil servants to have their premiums deducted. Only 17% of our patients have insurance and these also have better glycaemic controls than the children without insurance cover. Insulin is covered in the national health insurance scheme, but this is the premix (70/30) type, which is used for the twice daily injection regimen. Life for A child (LFAC) (23) a voluntary organisation has since 2015, helped Nigeria and other African countries get insulin to be given to indigent children for free. However, when these drugs are exhausted, children go weeks or months without insulin, increasing the risk for the poor glycaemic control. (24)

ISPAD has always advocated a multiple dose regimen for children with TIDM, (25) but the understanding that affordability, storage of insulin and stigmatisation may hinder this, twice daily insulin regimen is acceptable for children with TIDM in resource limited settings. (26) Though the difference was not significant, glycaemic controls of children on either free/ pre

mix insulin regimen was paradoxically lower than those on basal bolus regimen. Children on premix insulin had poorer controls in the study by Klaweit et al, and this may be because of the inconsistency in compliance, carbohydrate requirements and fear of hypoglycaemia. (27) The lower HbA1c in children on free mix, rather than basal bolus, may be because many of our patients started with pre-mix/free mix insulin and twice daily regimen and are used to this and so more compliant. So, while our multiple daily injections (basal bolus regimen) have recently just started, we have patients not taking their injections as at when due because of stigmatisation, amnesia or belief that is not needed all the time.

When the whole family or the parents are involved in the management of the child's diabetes, the control is relatively better than those of families that are less involved. The mean HbA1c levels of our children whose parents showed some degree of involvement was significantly lower than those that were less involved and this is similar to other studies. (3, 5, 19, 28) This invariably means strengthening the family relationship, improving parent-child relationship and psychological interventions will likely improve glycaemic controls of the children. (20, 29) This also makes it invaluable that all diabetic clinics and hospitals have psychologists collaborating with them to help all families cope with the management of diabetes.

In conclusion, poor glycaemic control is common with single-parent families and those with inadequate family functioning, difficulties in providing insulin and glucose testing. High HbA1c values are related to lower social and family functioning. While it is known that diabetes management is a complex web of individual and family management, engaging in this multidisciplinary care in Nigeria is both challenging and rewarding, when successful. No doubt there is much work to be done to help in maintaining proper glycaemic controls in children with diabetes, the most important is out of reach of the physicians, because helping families improve their economic power and status lies in the purview of the governments.

Limitations

This study is questionnaire based and it is limited by recall bias, and the perception of what is true to the best of the parents and the patient. While there was no inconsistency in the reports from both parents and patients, we acknowledge the possibility that families could exaggerate or under report stressors they may be encountering. Families could exaggerate to increase empathy and gain free insulin and testing kits, or under-report to prevent stigmatisation and or referral to other care providers/ authority.

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