Spectrum of Pediatric Endocrine Disorders at the Aminu Kano Teaching Hospital, Kano, Northwestern Nigeria: a five-year review

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Abstract

In many developing countries, including Nigeria, non-communicable diseases, such as endocrine disorders, are not given much attention because of the enormous burden posed by infectious diseases like malaria, tuberculosis, and other childhood killer diseases. In addition, endocrine disorders are thought to be uncommon due to a lack of specialized screening facilities and trained healthcare professionals to diagnose and manage these endocrine diseases. This study aims at defining the burden of pediatric endocrine disorders (PEDs)in Kano. A review of records of children who presented at the pediatric endocrine unit of Aminu Kano Teaching Hospital with pediatric endocrine disorders from 2018 to 2022 was carried out. A total of 6,314 new pediatric cases were seen during the study period, and 178 of these were pediatric endocrine disorders accounting for 2.8% of the total. The mean age of all the cases at presentation was 6.35±4.95 years, and male to female ratio was 1:1.3. Disorders of endocrine pancreas/lipids metabolism (68/178, 38%) were the commonest, followed by thyroid disorders (23/178, 12.9%) and pubertal disorders (16/178, 9%) respectively. Other disorders seen were calcium, phosphate metabolism, and bone disorders (15/178, 8.4%), syndromes (genetic syndromes/multiple congenital abnormalities) with endocrine system involvement (13/178, 7.3%), adrenal disorders (10/178, 5.1%) and disorders of energy balance (6/178, 3.4%). More females presented with disorders of the pancreas/lipids, thyroid, precocious puberty, and congenital adrenal hyperplasia. The highest number of cases was seen in the last year of review, while the lowest was in the third year of review. Type 1 diabetes mellitus and disorders involving the thyroid gland, pubertal development, adrenal gland, and bone were the five leading groups of childhood endocrine disorders encountered in our clinical practice at Aminu Kano Teaching Hospital.

Introduction

Effective communication between different parts of the body is absolutely essential for the functioning of the human body; this communication is maintained by nerve fibers and hormones.[1] Endocrinology is concerned with the nature of these hormones and with hormonal communication. Deviation from normal function of the hormones or hormonal communication constitutes endocrine diseases.[1,2]

Pediatric endocrinology relates to the diagnosis, management, and treatment of diseases of the endocrine system in children and adolescents.[3] These diseases include diabetes, disorders of growth, thyroid function, adrenals and sexual development, calcium, phosphate metabolism and bone disorders, obesity, and related complications, as well as endocrine cancers.[4-6] In many developing countries, including Nigeria, non-communicable diseases, such as endocrine disorders, are not given much attention because of the enormous burden posed by infectious diseases like malaria, tuberculosis and respiratory tract infections, and other childhood killer diseases.[7,8] In addition, there is a lack of specialized screening facilities and trained health professionals to diagnose and manage these endocrine diseases.[9,10] Therefore, the prevalence rate of pediatric endocrine disorders is underappreciated in our setting. Globally, the burden of endocrine diseases is on the increase, attributable to changing lifestyles, environmental pollution, and improving diagnostic capabilities.[11,12] However, this increase is less appreciated in our setting when compared with the developed world due to a lack of attention to the problem.[13,14]

The main objective of the study was to determine the burden and pattern of Pediatric Endocrine Disorders (PEDs) in our center. The study is expected to provide a more representative descriptive picture that will serve as baseline data and acquaint healthcare professionals with the common endocrine disorders in their areas of practice as compared to other pediatric problems for adequate preparation and response to the challenges they pose.

Materials and Methods

The study was a retrospective study of all children seen and managed with suspected pediatric endocrine disorders at the Pediatric Endocrinology Unit of the Aminu Kano Teaching Hospital (AKTH). The center serves as a major referral center for public and private hospitals within Kano and adjoining states. Data, including age at presentation, gender, clinical features, and diagnosis of children with PEDs between January 2018 and December 2022, were extracted from the clinic register and patients' case notes. Patients were referred, on suspicion of endocrine disorders, to the unit from pediatric outpatient clinics and pediatric specialist units of our center and other public and private hospitals. Diagnoses were made using a combination of clinical features and laboratory investigations. Facilities for radiological and most chemical investigations were available at the hospital laboratory. Where the hospital did not have the facilities to carry out serological investigations, two private laboratories of international standards filled in the gap. In this study, diagnoses were further classified according to the International Classification of Pediatric Endocrine Diagnosis (ICPED).[15] Ethical clearance for the study was obtained from the Health and Research Ethics Committee of the AKTH.

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Statistical analysis

The data extracted were entered into Statistical Package for the Social Sciences version 20.0 (IBM Corp. Armonk, USA). Descriptive analysis of frequency distributions of qualitative variables was tabulated, whereas mean and Standard Deviation (SD) for quantitative variable were calculated.

Results

Six thousand three hundred and fourteen new pediatric cases were seen during the study period, and 178 of these were PEDs, accounting for 2.8% of the total. The mean age of all the cases at presentation was 6.35±4.95 years, and male to female ratio was 1:1.3. Out of the total pediatric endocrine patients reviewed during the study period, disorders of endocrine pancreas/lipids metabolism (68/178, 38%) were the commonest, followed by thyroid disorders (23/178, 12.9%) and pubertal disorders (16/178, 9%) as shown in Table 1. Other disorders seen were calcium, phosphate metabolism, and bone disorders (15/178, 8.4%), syndromes (genetic syndromes/multiple congenital abnormalities) with endocrine system involvement (13/178, 7.3%), adrenal disorders (10/178, 5.1%) and disorder of energy balance (6/178, 3.4%). More females presented with disorders of the pancreas/lipids, thyroid disorders, precocious puberty, and congenital adrenal hyperplasia (Table 2). The highest number of cases was seen in the last year of review, while the lowest was in the third year of review (Figure 1).

Discussion

Out of the total patients seen in the five years of review, 178 were PEDs, accounting for 2.8%. We managed a comparatively larger number of PEDs compared with previous reports from other parts of Nigeria; Oluwayemi, over an 8-year period in Ekiti State, managed 57 cases,[13] Onyiriuka et al., over 10 years in Benin, managed 99,[14] and Jarrett et al., over eight years in Ibadan, managed 110 children with PEDs.[15] The relatively higher case load in our facility possibly reflects the fact that Kano is a highly populous city compared to the aforementioned cities. This may be buttressed by a similarly comparatively large case-load of PEDs at two teaching hospitals in Lagos where Akinola *et al*.[16] in Lagos State University Teaching Hospital (LASUTH) managed 172 children with PED over three years, and Oyenusi *et al*.[17] in Lagos University Teaching Hospital (LUTH) managed 546 children over 10 years.

Diabetes Mellitus (38%) was the commonest PED in this study. Sixty-five (36.5%) cases out of the 68 DM patients had Type 1 Diabetes Mellitus (T1DM) while two had Type 2 Diabetes Mellitus (T2DM), and one was steroid-induced DM in a Nephrotic Syndrome child on prolonged steroid therapy. This high frequency of DM is similar to the findings of Akinola *et al*.[16] in LASUTH, and Onyiriuka *et al*.[14] in UBTH, Edo State, Nigeria. Among the DM patients, there was female preponderance in our report with a male: female ratio of 1:1.7, similar to what was also observed in Abakaliki by Ibekwe,[18] with a male:female ratio of 1:1.2, and in Lagos by Akinola *et al*.[16] with a ratio of 1:1.5. Only a few of the patients diagnosed with diabetes, presented with classical symptoms of the disease; polyuria, polydipsia, and weight loss. The majority of the T1DM patients (89%) presented with Diabetic Ketoacidosis (DKA). Similarly, some local studies in

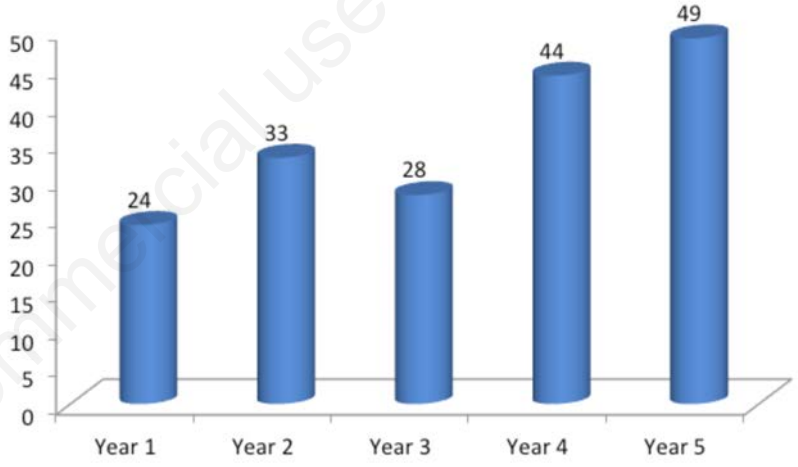

Figure 1. Yearly distribution of pediatric endocrine cases.

Table 1. Categories of Paediatrics Endocrine Disorders (PEDs).

Disorders	Frequency (N)	Percentage (%)	Age range (years)	Male:Female ratio (M:F)
Puberty disorders	16	9	0.8–17	1:1.7
Thyroid disorders	23	12.9	0.3–10	1:1.6
Disorders of pancreas/lipids	68	38	1.4–17	1:1.7
Sex development/gender disorders	7	3.9	0.02–7	1.3:1
Disorders of energy balance	6	3.4	8–14	01:02
Syndromes with endocrine disorders	13	7.3	0.8–8	1.2:1
Testicular/male reproductive tract disorders	8	4.5	0.3–14	08:00
Adrenal disorders	10	5.1	0.01–4	01:04
Pituitary/hypothalamic disorders	3	1.7	4–11	02:01
Calcium, phosphate metabolism and bone disorders	15	8.4	0.4–13	1.2:1
Growth disorders	4	2.2	3.5–10	03:01
Others (non-classified)	5	2.8	0.03–0.8	1:1.5
Total	178	100		

Nigeria, including studies from Abakaliki (88%),[18] Jos (75%),[19] and other developing countries such as Tanzania (90%)[20] and Congo (90%)[21] also reported a high prevalence of DKA at first presentation in their patients with T1DM. This similarity may be explained by the possible low level of awareness of signs and symptoms of diabetes in children among parents coupled with inter□current infections and poverty, in addition to poor health services with late diagnosis and poor management in developing countries. There is need for more public enlightenment on diabetes in children and routine screening of children and adolescents for diabetes. In the current study, we reported few children with T2DM; this finding is similar to other reports from Nigerian studies.[13-16] This may suggest a possible new trend in PEDs in Nigeria in view of the rising global diabetes epidemic, which involves adults and children.[22] Clinicians need to be aware of this trend so that they can evaluate children with diabetes more thoroughly rather than assuming that T2DM only occurs in adults. One child with steroid-induced diabetes was also observed as a cause of diabetes in the current study. Since it is an established fact that this complication may arise from prolonged steroid use.[23] Children who are placed on steroids for long periods should be screened periodically for hyperglycemia, rather than wait for overt symptoms of diabetes to occur.

Thyroid disorder is the second most frequent PED in our findings. This is in keeping with findings from other studies in Nigeria[14-16] where high frequency of thyroid problems was documented. In addition,

Table 2. Distribution of Paediatric Endocrine Disorders (PEDs).

ICPED Class/Specific diagnosis	Frequency N	Percentage (%)	Age range (years)	Male:Female ratio (M:F)
Puberty disorders	16	9	0.8–17	1:1.7
Precocious puberty	8	4.5		01:02
Precocious thelarche	4	2.2		00:04
Delayed puberty	4	2.2		03:01
Thyroid disorders	23	12.9	0.3–10	1:1.6
Simple/multinodular goitre	2	1.1		00:02
Hypothyroidism	13	7.3		1.6:1
Grave's disease	4	2.2		00:04
Hyperthyroidism	2	1.1		00:02
Thyroglossal cyst	2	1.1		01:01
Disorders of pancreas/lipids	68	38	1.4–17	1:1.7
T1DM	65	36.5		1:1.6
T2DM	2	1.1		00:02
Steroid-induced diabetes	1	0.6		01:00
Sex development/gender disorders	7	3.9	0.02-7	1.3:1
DSD	5	2.8		1:1.5
Hypospadias	2	1.1		02:00
Disorders of energy balance	6	3.4	8–14	01:02
Obesity	6	3.4		01:02
Syndromes with endocrine disorders	13	7.3	0.8–8	1.2:1
Down syndrome	5	2.8		1.5:1
Multiple congenital anomalies	4	2.2		01:01
Turner syndrome	2	1.1		00:02
Prader Willi syndrome	2	1.1		02:00
Testicular/male reproductive tract disorders	8	4.5	0.3–14	08:00
Micropenis	4	2.2		04:00
Absent/atrophic testes	3	1.7		03:00
Testicular mass	1	0.6		01:00
Adrenal disorders	10	5.1	0.01–4	01:04
Premature adrenarche	4	2.2		00:04
Congenital adrenal hyperplasia	5	2.8		01:02
Addison's disease	1	0.6		01:00
Pituitary/hypothalamic disorders	3	1.7	4–11	02:01
MPHD	3	1.7		02:01
Calcium, phosphate metabolism and bone disorders	15	8.4	0.4-13	1.2:1
Rickets	10	5.6		1:1.5
Hypoparathyroidism	4	2,2		03:01
Pseudohypoparathyroidism	1	0.6		01:00
Growth disorders	4	2.2	3.5-10	03:01
Achondroplasia	2	1.1		01:01
Short stature	2	1.1		01:01
Others (non-classified)	5	2.8	0.03–0.8	1:1.5
Infants of mothers with endocrine disorders	3	1.7		01:02
Hypoglycaemia	2	1.1		01:01
Total	178	100		

ICPED, International Classification of Pediatric Endocrine Disorders; T1DM, Type 1 Diabetes Mellitus; T2DM, Type 2 Diabetes Mellitus; DSD, Disorders of Sex Differentiation: MPHD, Multiple Pituitary Hormone Deficiency.

thyroid problems are generally common in children.[24] Congenital hypothyroidism constituted a significant proportion of the diagnosis in this group, in a setting where newborn screening is not routinely carried out. There is a high probability that the introduction of a newborn screening program for congenital hypothyroidism will result in the diagnosis of more babies with this condition, as is the case in many parts of the developed world.

The third common PED group in this study was pubertal disorders. This is not surprising because puberty is a major developmental stage[25] and a main cause for concern by parents when it occurs early or late. However, in this study, early puberty was the most frequent pubertal problem.

Calcium, phosphate metabolism, and bone disorder were the fourth PED in this study, and the most frequent problem in this group was rickets, 10 (5.6%). This high frequency of rickets was seen despite the fact that rickets was also managed by the Paediatric Gastroenterology Unit, being partly a nutritional disorder, and also at the Orthopedic Unit of the Surgery Department. Some studies[13,14,16] in Nigeria also reported similar findings of frequent cases of rickets. Eight of the cases of rickets in the present study were vitamin D-dependent and associated with hypocalcemia. Out of the eight cases, five were managed with oral vitamin-D2 and calcium, while three had parenteral vitamin-D2 (stoss therapy) and oral calcium because of poor response to the oral treatment, probably due to poor compliance with the daily intake of the oral vitamin-D2. Out of the ten cases of rickets in this report, two were familial hypophosphatemic rickets that were managed with oral phosphate and 1α-hydroxyvitamin D3.

Obesity was found to be a fairly common PED in the present study, and about two-thirds of this was caused by excessive calories. This finding is also similar to reports from other centers.[14,16] Another cause of obesity in the present study was due to a genetic disorder, specifically, Leptin deficiency. Overweight and obesity are becoming a global problem among children and adolescents, and there is a need to curb this through health education, appropriate diet, and exercise to prevent associated non-communicable diseases like T2DM and hypertension.

There is a steady increase in the number of PEDs seen in our unit during the study period, even though there was a decrease in the number of patients who presented in the third year under review. This might have been due to the effect of Covid-19 pandemic during the period, as there was a general decrease rate of turnover of patients in all healthcare facilities during the Covid-19 pandemic. The steady increase could be due to increasing awareness within and outside our center created through seminars for healthcare workers, health talks in schools, and television on World Diabetes Day, coupled with training of resident doctors and nurses in growth monitoring and management of diabetes in children and adolescents. PEDs are not as common when compared with infectious diseases, hematological disorders, neurological disorders, and other common pediatric problems, but it demands the attention of healthcare professionals and policymakers because when diagnosed and treated early, it improves the quality of life of affected children thereby impacting positively on the social and economic status of the family and country at large. Therefore, more effort is still needed to educate and inform people and policymakers about PEDs in the State and the country in general. There is also a need for public-private partnerships to make investigations and management of PEDs accessible, affordable, and feasible, because financial constraint is a great limitation in comprehensive investigation and management of affected children and adolescents in Nigeria.

Conclusions

T1DM and disorders involving the thyroid gland, pubertal development, adrenal gland, and bone were the five leading groups of childhood endocrine disorders encountered in our clinical practice at Aminu Kano Teaching Hospital. The retrospective nature of our report is a limitation due to the relatively poorer data quality of retrospective reviews compared to prospective studies.

References

1. HM Goodman. Introduction. In: Basic Medical Endocrinology. Raven Press, New York, USA. 1988. p.1–25
2. GA Hedge, HD Colb, RL Goodman. General principles of endocrinology. In Clinical Endocrine Physiology, WB Saunders Co., Philadelphia, USA. 1987. p. 3–33.
3. M Zacharin, JP Chanoine, F Cassorla, et al. Promoting excellence in the care of pediatric endocrine diseases in the developing world. Pediatrics 2013;131: 573–8.
4. DB Dunger, MA Sperling, CL Acerini, et al. European Society for Paediatric Endocrinology/Lawson Wilkins Pediatric Endocrine Society consensus statement on diabetic ketoacidosis in children and adolescents. Pediatrics 2004;113:133–40.
5. P Cohen, AD Rogol, CL Deal, et al. Consensus statement on the diagnosis and treatment of children with idiopathic short stature: a summary of the Growth Hormone Research Society, the Lawson Wilkins Pediatric Endocrine Society, and the European Society for Paediatric Endocrinology Workshop. Journal of Clinical Endocrinology and Metabolism 2008;93: 4210–7.
6. J L´eger, A Olivieri, M Donaldson, et al. European society for paediatric endocrinology consensus guidelines on screening, diagnosis, and management of congenital hypothyroidism. Hormone Research in Paediatrics 2014;81:80–103.
7. UNAIDS, WHO. AIDS epidemic update: December 2005. Available from: https://data.unaids.org/publications/irc-pub06/epi_update2005_en.pdf
8. R Snow, C Guerra, A Noor, et al. The global distribution of clinical episodes of plasmodium falciparum malaria. Nature 2005;434:214-7.
9. ES Majaliwa, BEJ Elusiyan, OO Adesiyun, et al., Type 1 diabetes mellitus in the African population: epidemiology and management challenges. Acta Biomedica de l'Ateneo Parmense 2008:79:255–9.
10. GL Warne, J Raza. Disorders of sex development (DSDs), their presentation and management in different cultures. Reviews in Endocrine and Metabolic Disorders 2008;9:227–36.
11. OO Akinkugbe OO. Non-communicable diseases in Nigeria: the next epidemic. Niger J Clin Pract 2000;3:904-7.
12. S Kadir. Tackling cardiovascular disease in Africa. BMJ 2005;331:711-2.
13. IO Oluwayemi, AF Taiwo, To Ayeni. Eight Year Review of Paediatric Endocrine Cases Seen In Ekiti State University Teaching Hospital. Indian J Appl Res 2017;7:506-773.
14. AN Onyiruika, M Kouyaté. Paediatric endocrine disorders as seen at the University of Benin teaching hospital over a ten-year period. Niger J Paediatr 2014;41:316-20.
15. OO Jarrett, BO Ogunbosi, OO Ayoola. Paediatric endocrine disorders at the university college hospital, Ibadan: 2002–2009. Ann Ib Postgrad Med 2013;11:96-101.
16. IJ Akinola , AO Afiemo, PO Ubuane, OA Odusote. Paediatric endocrine disorders at a tertiary hospital in Lagos, Nigeria. Niger J Paediatr 2022;49: 9–

74.
17. EE Oyenusi, EO Ajayi, FD Akeredolu, AO Oduwole. Pattern of thyroid disorders in children and adolescents seen at the Lagos University Teaching Hospital, Nigeria, over a 10-year period. Niger Med J 2017;58:101-6.
18. MU Ibekwe, RC Ibekwe. Pattern of Type 1 Diabetes Mellitus in Abakaliki, Southeastern, Nigeria. Pediatric Oncall. [serial online] 2011. Available from: http://www.pediatriconcall.com
19. OO Ayoola. Recent advances in childhood diabetes mellitus. Ann Ib Postgrad Med 2008;6:9–20.
20. ES Majaliwa, E Munubhi, K Ramaiya, et al. Survey on acute and chronic complications in children and adolescents with type 1 diabetes at Muhimbili National Hospital in Dar es Salaam, Tanzania. Diabetes Care 2007;30: 2187–92.
21. CF Otieno, JK Kayima, EO Omonge, GO Oyoo. Diabetic ketoacidosis: Risk factors, mechanisms and management strategies in sub–Saharan Africa: A review. East Afr Med J 2005;82: S197–203.
22. R Unnikrishnan, R Pradeepa, SR Joshi, V Mohan . Type 2 diabetes: demystifying the global epidemic. Diabetes. 2017;66:1432-42.
23. JL Hwang, RE Weiss. Steroidinduced diabetes: a clinical and molecular approach to understanding and treatment. Diabetes Metab Res Rev 2014;30:96-102.
24. TR Bandgar, NS Shah. Thyroid disorders in childhood and adolescence. J Indian Med Assoc 2006;104:580-2.
25. S Leka-Emiri, GP Chrousos, C Kanaka-Gantenbein. The mystery of puberty initiation: genetics and epigenetics of idiopathic central precocious puberty (ICPP). J Endocrinol Invest 2017;40: 789-802.