



## Survey on Knowledge of Healthcare Providers about Childhood Diabetes Mellitus in Tertiary healthcare Institution in a resource-limited setting

\*Yarhere Iroro Enameguolo, Jaja Tamunopriye

Endocrinology unit, Department of Paediatrics, University of Port Harcourt Teaching Hospital, Port Harcourt.

\*Corresponding Author: [iroro.yarhere@uniport.edu.ng](mailto:iroro.yarhere@uniport.edu.ng); [iroroy91@yahoo.com](mailto:iroroy91@yahoo.com); GSM: +2347067987148

### Abstract

**Background:** *With increasing prevalence of childhood DM, it is important that health care providers know about the disease and manage this properly. We aimed to survey the knowledge and experience of health care providers in tertiary institution so as to make informed recommendations.*

**Methods:** *Pretested self-administered and standardised questionnaires were distributed to nurses, and residents including paediatricians- in - training in a tertiary health institution. The knowledge and proficiency questionnaires were made simple and multi choice to reduce ambiguity. Mean knowledge was compared using ANOVA, and Tukey post hoc analyses and p values <0.05 were considered significant.*

**Results:** *Two hundred questionnaires were distributed and 185 were returned filled giving a response rate of 92.5%. There were 80 (43.2%) nurses, and 105 (56.8%) doctors, 41 (22.2%) of which were paediatricians or paediatricians-in-training. Paediatric residents had higher overall mean knowledge in all aspects evaluated. About 60% of respondents correctly identified diagnosis of DM based on FBG, and 61.6% got the response for random BG. Forty six (24.9%) of respondents did RBG for all children attending their facilities, only 16 of these were paediatric residents. Nurses were willing to give OHA to established T1DM children.*

**Conclusion:** *Many health workers have little knowledge and practice experience in DM with the attendant effect of poor management of these children. We thus recommend a review of undergraduate medical curriculum, and CME to limit this dearth in knowledge.*

**Key words:** *Survey, Knowledge, Diabetes Mellitus, Health care providers, Nigeria*

### Introduction

Childhood type 1 diabetes mellitus like many other non-communicable diseases is increasing in prevalence and its complications lead to death. <sup>1</sup> The Nigeria University commission curriculum for paediatric undergraduate training provides for diabetes lectures in the clinical sciences. The basic sciences also cover pathophysiology and clinical chemistry of the disease but how much of these basics is retained for proper evaluation of a child with diabetes remains unknown. <sup>2</sup> Many children present to primary health care centers in diabetic ketoacidosis, which mimics many viral and parasitic diseases and the health care providers rarely recognize the presentation leading to pre-diagnosis mortality beyond that reported in developed countries. <sup>3</sup>



With the rising incidence of diabetes mellitus among children following awareness, early diagnosis and management by competent health care personnel should prevent prolonged hospital stay and complications from diabetes mellitus, but this is not so in many developing and Sub-Saharan countries.<sup>4</sup> Patients usually present to non-specialist clinics and hospitals where knowledge of diabetes in children may be insufficient thus increasing the duration between presentation and eventual diagnosis of the condition. Management of the condition starts from the primary care level and if this is lacking, the risk of long term debilitating complications is very possible.<sup>5</sup> Many non-specialist doctors and nurses run the primary health care centers, and since they are likely to be the first contacts between health care and patients, it is necessary to evaluate their competence and proficiency in managing diabetes mellitus.<sup>5,6</sup> The practices in these health care centers concerning diabetes mellitus are largely unknown and it is expected that competence in diagnosis and first sets of management option can prevent complications.

Diabetic education remains a panacea for proper management and prevention of diabetes and in countries with limited resources for management, prevention of acute and chronic complications may be achieved through this means.<sup>6</sup> The situation may not be totally different in secondary and tertiary health institutions as many health care providers are unaware of the possibility of childhood diabetes. Understanding the level and depth of knowledge of diabetes mellitus among health care workers will help formulate continuing medical education curriculum and possibly improve diagnosis and care of children with diabetes mellitus before presenting to specialist. It is for this reason the authors embarked on this survey to evaluate the knowledge and practice of health care personnel working in a tertiary health institution in a resource - limited setting in order to advocate for review of training curriculum if there was need.

## **Methodology**

A pretested self-administered questionnaire was distributed to health care personnel, doctors and nurses in the University of Port Harcourt Teaching Hospital in this cross sectional study. The authors developed the questionnaire and standardised it for resident doctors and nurses to fit the environment by administering the questionnaires unfiltered to 20 nurses included in the final analyses during one of their lecture series. The questionnaires distributed assessed simple pathophysiology, diagnostic criteria of diabetes and experiences in managing children with diabetes or conditions mimicking diabetes. Respondents were made to give their answers on the spot without referring to any textbooks and the questionnaires were collected immediately the respondents were through. Responses were "Yes", "No" or "Don't know", single answer multiple choice and open ended questions. For the multiple-choice questions, unanswered questions were counted as wrong with the assumption that respondents did not know the correct answer. Demography included age group, sex, profession, cadre in the profession, subspecialty, and years of practice. The respondents were further divided into three (3) sub groups; paediatric residents (labeled, paediatrics), nurses (labeled nurses) and other residents (labeled residents) for proper comparison of knowledge and practice.



Data obtained were entered into and analysed with SPSS 20. Mean knowledge difference between and within professions was compared using ANOVA, and Tukey post hoc analyses. Pearson Chi square test or correlation test was used to test difference in proportions between groups and p values <0.05 were considered significant.

## **Results**

### **Demography of study population**

There were 124 (67.0%) females and 61 (33.0%) males, ages ranged from 25 – 50 years with a median age of 32.5 years. A large percentage 72.97% of the respondents had been in practice for less than 10 years and only 15.13% had been practicing for over 25 years.

### **Knowledge**

Two hundred questionnaires were distributed and 185 were returned filled giving a response rate of 92.5%. There were 80 (43.2%) nurses, and 105 (56.8%) doctors, 41 (22.2%) of which were paediatricians-in-training.



**Table 1. Percentages of correct responses to individual questions according to group**

	Total C N (%)	Paeds N (%) 41	Residents N (%) 64	Nurses N (%) 80	p
Does diabetes mellitus occur in children?	176 (95.1)	41 (100)	62 (97)	73 (91.2)	0.247
Does diabetes mellitus occur in infants?	84 (45.4)	29 (45.3)	26 (32.5)	26 (32.5)	0.001
Diabetes Mellitus in children is due to excessive consumption of sugar/sweet drinks	169 (91.4)	41 (100)	62 (97)	66 (82.5)	0.005
Diabetes mellitus in children is mainly due to (a) excess insulin (b) insulin deficiency	43 (23.3)	8 (19.5)	17 (26.6)	18 (22.5)	0.012
Diabetes mellitus in children is diagnosed when fasting blood glucose is >7.2 mmol/L	156 (84.3)	39 (95.1)	54 (84.4)	63 (78.8)	0.133
Diabetes mellitus in children is diagnosed when random blood sugar is >11.1 mmol/L	109 (58.9)	37 (90.2)	38 (59.4)	34 (42.5)	<0.001
The most important aspect of management in children with diabetes mellitus is patient education and counselling	114 (61.6)	36 (87.8)	48 (75)	30 (37.5)	<0.001
If you see a child with established diagnosis of type 1 diabetes mellitus, which of the following will you do? Commence insulin therapy	55 (29.7)	26 (63.4)	20 (31.2)	9 (11.2)	<0.001
Children with diabetes mellitus can eat all foods ( <b>true</b> or false)	87 (47.0)	31 (75.6)	25 (39.1)	31 (38.8)	<0.001
If a child with diabetes mellitus is sick, insulin should be discontinued ( <b>Yes, No</b> )	153 (82.7)	41 (100)	45 (70.3)	67 (83.8)	0.004
If a child with diabetes mellitus is sick, urine ketones should be checked regularly ( <b>Yes, No</b> )	154 (83.2)	40 (97.6)	49 (76.6)	65 (81.2)	0.058
Diabetes mellitus in children is treated for life ( <b>Yes, No</b> )	140 (75.7)	38 (92.7)	51 (79.9)	51 (63.7)	0.001

Of the 64 residents, 13 (20.3%) would rather refer a child with established T1DM to adult endocrinologist than a paediatric endocrinologist, and 2 nurses would refer for native medications (Table 2).

**Table 2. Respondents line of action upon contact with established T1DM patient**

	Upon 1 <sup>st</sup> contact with established T1DM, what will you do?						Total
	insulin +FU	diet + FU	OHA + FU	adult endo	native medic	other	
Residents	25	10	2	13	0	14	64
Nurses	31	16	12	11	2	8	80
Paediatrics	31	5	0	0	0	5	41
Total	87	31	14	24	2	27	185

\* FU = Follow-up, OHA = Oral hypoglycaemic agent,

Paediatric residents had a mean score of  $10.59 \pm 1.38$ , other residents  $8.06 \pm 1.81$ , and nurses had the least with  $6.98 \pm 1.81$  out of 12 score-assigned questions, and the difference in means was statistically significant,  $F = 57.17$ ,  $p < 0.001$  (Figure 1).

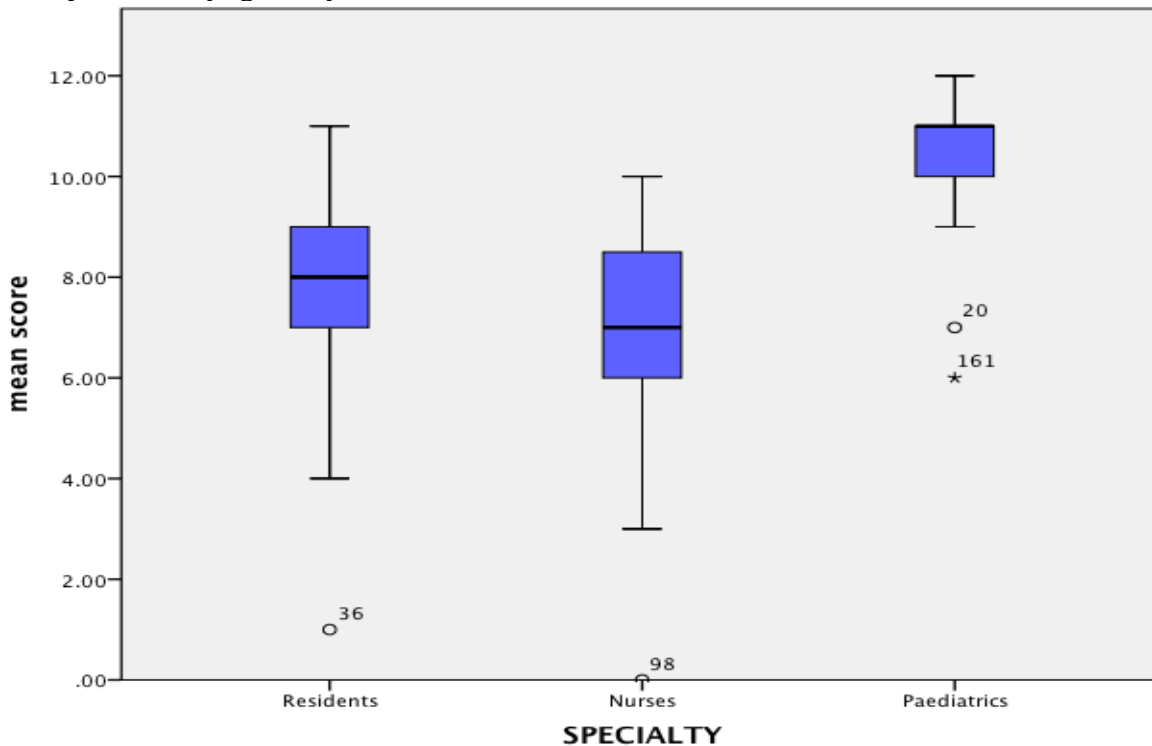


Fig 1. Boxplot of mean knowledge of respondents with the pediatric residents having highest mean knowledge score.

The overall mean score for all respondents was 8.54 (71.19%). Post hoc analyses showed the differences



were between the various specialties (Table 3).

Table 3. Post hoc Tukey analyses of mean score differential between specialties

(I) SPECS	(J) SPECS	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Residents	Nurses	1.08750*	.29513	.001	.3901	1.7849
	Paediatrics	-2.52287*	.35203	.000	-3.3547	-1.6910
Nurses	Residents	-1.08750*	.29513	.001	-1.7849	-.3901
	Paediatrics	-3.61037*	.33801	.000	-4.4091	-2.8116
Paediatrics	Residents	2.52287*	.35203	.000	1.6910	3.3547
	Nurses	3.61037*	.33801	.000	2.8116	4.4091

\* The mean difference is significant at the 0.05 level.

### Practice

One hundred and twenty six (68.1%) respondents did not do routine blood glucose estimation for sick children but 140 (75.7%) did for children admitted into their care that were unconscious. Just like all respondents, the number of paediatric residents that performed random blood glucose for their patients were noted to increase from during routine clinic visits 16 (39%) to admission 23 (56%) and then the admitted unconscious child 41 (100%), Table 4.

Table 4. Respondents who did blood glucose for various categories of children presenting to their units

Response	RBS (sick child)	RBS (admitted)	RBS (unconscious)
<b>Yes n (%)</b>	46 (24.9)	53 (28.6)	140 (75.7)
<b>No n (%)</b>	126 (68.1)	116 (62.8)	31 (16.7)
<b>No response n (%)</b>	13 (7)	16 (8.6)	16 (8.6)
<b>Total n (%)</b>	185 (100)	185 (100)	185 (100)
<b>P-value</b>	p = 0.140	p = 0.001	p = 0.001



In 1 year prior to this survey, 124 (67%) of respondents had seen children with diabetes mellitus, and 39 of these were Paediatric residents. The difference in proportion between the professions was significant, Table 5.

Table 5. Respondents that had seen children with Diabetes Mellitus in the past 1 year

Responses		Residents	Nurses	Paediatrics	Total
No	No. (%)	26 (40.6)	33 (41.2)	2 (4.9)	61 (33.0)
Yes	No. (%)	38 (59.4)	47 (58.8)	39 (95.1)	124 (67.0)
Total		64 (100.0)	80 (100.0)	41 (100.0)	185 (100.0)

p < 0.001

Of the 39 paediatric residents who had seen children with diabetes mellitus in the past 1 year, 33 (80.5%) had managed these children to their logical conclusion, while 58.8% of nurses assisted in managing these children. Table 6.

Table 6. Specialties that had managed children with Diabetes Mellitus in the past 1 year

Responses		Residents	Nurses	Paediatrics	Total
No	No. (%)	50 (78.1)	49 (61.2)	8 (19.5)	61 (33.0)
Yes	No. (%)	14(21.9)	31 (38.8)	33 (80.5)	124 (67.0)
Total		64 (100.0)	80 (100.0)	41 (100.0)	185 (100.0)

p < 0.001

Many other residents had seen children with diabetes but were quick to refer them to paediatricians without doing much before referral. Some other residents, 14 (21.9%) had managed childhood diabetes, and 31 (38.8%) nurses also admit to having managed children with Diabetes mellitus.



## Discussion

With the increasing number of diabetes mellitus in Nigerian children, it is necessary that healthcare workers irrespective of specialization, have some basic knowledge concerning the disorder. One of the greatest obstacles to management of diabetes mellitus is lack of knowledge among health workers. With 95.1% of respondents recognizing the possibility of DM in children, it is unlikely that the diagnosis will be missed. This is unfortunately not so for diabetes in infants, with more than half of respondents denying the possibility of DM in infants. Surprisingly paediatric residents were also ignorant of DM in infants and this may be attributed to the fact that DM in infants is relatively rare and there are few reported cases in Nigeria. This poor knowledge is not limited to the study population as van Zyll et al <sup>7</sup> and Oosthuizen<sup>8</sup> both reported similar finding in South Africa. The knowledge of recognition of the disease is however not translated to pathophysiology and diagnosis, as only 23% of respondents knew DM in children was due to insulin deficiency.

Making diagnosis of DM in children using Fasting blood glucose may not be difficult for 85% of respondents, but only 58% could get the accurate cut off for random blood glucose. This is particularly worrisome, as most children in emergency cases will not present to health care facility fasted, and so DM may be missed in these circumstances. The higher percentage of positive answers for the fasting blood glucose may be attributed to the fact that the criteria for diagnosing DM in adults are not different from children.

Noting that diabetic education is one of the most important aspects of diabetes management, 39% of respondents thought insulin therapy was the most important. Unfortunately, nurses who are supposed to do the diabetes education and reinforce this were the most deficient in this knowledge. Dearth in diabetes mellitus knowledge in nurses was also noted in other studies. <sup>9,13-15</sup> It can be understood that respondents will think insulin therapy is the most important, but to take insulin properly, diabetes education on the process and technique to use will be more important. Nurses play a major role in the management of DM and should be well informed not only to help management, but also to educate the patients. The consequences of such knowledge gap as observed by some anecdotal reports and experience of clinicians including the authors are scenarios where nurses actually tell patients to stop their insulin and use dietary management for all types of DM. The experience may be different in more advanced countries and in places where diabetes mellitus is more prevalent, possibly due to reinforcement of knowledge and teaching.

The evaluation of next response in the questionnaire actually laid credence to our anecdotal experience, as only 38.8% of nurses would give insulin and follow-up a T1DM patient. Other respondents decided they would give dietary advice or refer to adult endocrinologist. Curiously, 2 nurses thought they would refer their patient for native medication and some others for prayers. Incidentally, no medical doctor chose that option, possibly out of knowledge or pride, but in Africa, faith based medicine and traditional medicine still thrive,





and some Ugandan authors tried to give reasons for this in their research.<sup>12</sup> Paediatric residents who would not start insulin decided to refer the patient to paediatric endocrinologists.

For some teachers of the profession who believe there is an increase of sub-specialty at the expense of the general specialist, there seems to be justification for their argument here. Waiting to refer a patient to endocrinologist may be the ideal but may not always be feasible as they are not always available. Until recently, there was only one Paediatric endocrinologist in Nigeria, but with training by European Society for Paediatric Endocrinology, in paediatric Endocrinology Training Center for Africa (PETCA) and West Africa (PETCWA), many more have been licensed.<sup>2</sup> Understanding the pharmacology and effects of insulin may be the factor against insulin prescription and administration, so nurses may not be wrong in refusing to prescribe insulin. Paediatric residents however do not have any excuses.

The overall mean score of all respondents was high, but the scores from the paediatric residents aided this. The reported scores in this study were higher than average scores from previous studies that assessed level of knowledge of DM among specialists in UK<sup>12</sup> and Switzerland.<sup>13</sup> The observed differences may be due to the difference in the questionnaire tool, which was tailored towards our environment. The need for care specific continuing medical education is more emphasized from this study to improve the basic knowledge base of health care workers and possibly the general population as this can help in preventing the complications of diabetes mellitus in children as noted by Piagassi and O'Brien et al.<sup>14,15</sup>

Due to the knowledge and practice gaps which have been highlighted by this study, it is obvious that cases of missed diagnosis of diabetes mellitus in paediatric practice would be quite common in resource - limited settings like Nigeria as about 75% of respondents in this study did not perform a random blood glucose test for sick children. The consequence of waiting till a patient is unconscious before doing their RBG will be a definite increase in the tendency towards having more complications especially if that child was in DKA before presentation. It is therefore important to emphasize the need for promoting blood glucose testing for every sick child needing medical care. Practice makes perfect, so the more children with DM health personnel come in contact with, the more knowledge they are likely to acquire over the years and become proficient in their management.

**Conclusion:** Despite increasing prevalence in childhood DM, many health workers have insufficient knowledge and practice experience in the condition with the attendant effect of poor management of these children.

**Competing interests:** The authors declare that they have no competing interests and the research did not get any funding from any industry.

**Authors' contributions:** YI and JT were the principal authors and contributed to the concept, design, literature search and interpretation of data and drafting of manuscript. YI did the data analyses, result



interpretation and discussion. JT contributed to acquisition of data and drafting of manuscript. Both authors read and approved the final manuscript.

## References:

1. Zacharin M, Chanoine JP, Cassorla F, Brink S, Hanas R, Fideleff H, Oduwole A, Shah, Hochberg Z. Promoting excellence in the care of pediatric endocrine diseases in the developing world. *Pediatr* 2013; 131e 573-8.
2. Guideline on minimal standards of Medical and Dental Education in Nigeria. The Red Book, Medical and Dental Council of Nigeria. Revised Edition June 2006. Publisher: Medical and Dental Council of Nigeria.
3. Ogbera A O, Ekpebegh C. Diabetes mellitus in Nigeria: The past, present and future. *World J Diabetes* 2014; 15:905- 911.
4. Majaliwa E, Elusiyun J, Yarhere I, Laigon'g P, Adesiyun O, Iughetti L, Muze K et al. Type I diabetes mellitus in the African population: epidemiology and management challenges. *Acta Biomed* 2008; 79: 255-9.
5. Unachukwu CN, Agomuoh DI, Alasia DD. Pattern of non-communicable diseases among medical admissions in Port Harcourt, Nigeria. *Nig J Clin Pract* 2008; 11(1):14 – 17.
6. Gill G. V, Mbanya J.C, Ramaiya. K L, Tesfaye S. A sub-Saharan African perspective of diabetes. *Diabetologia* 2009; 52:8–16.
7. Van Zyll P Rheeder. Survey on knowledge and attitudes regarding diabetic inpatient management by medical and nursing staff at Kalafong Hospital. *J Endocrinol Metab Dis S Afr* 2008; 13: 90-97.
8. Oosthuizen H, Riedijk R, Nonner J, Rheeder P, Ker JA. An educational intervention to improve the quality of care of diabetic patients. *S Afr Med J* 2002; 92(6): 459-464.
9. Ahmed A, Jabbar A, Zuberi L, Islam M, Shamim K. Diabetes related knowledge among residents and nurses: a multicenter study in Karachi, Pakistan. *BMC Endocrine Disorders* 2012; 12:18.
10. Rubin DJ, Moshang J, Jabbour SA: Diabetes knowledge: are resident physicians and nurses adequately prepared to manage diabetes? *Endocr Pract* 2007; 13(1):17–21.
11. Rutebemberwa E, Lubega M, Katureebe S K, Oundo A , Kiweewa F, Mukanga D. Use of traditional medicine for the treatment of diabetes in Eastern Uganda: a qualitative exploration of reasons for choice. *BMC International Health and Human Rights* 2013; 13:1.



12. Cheekati V, Osburne RC, Jameson KA, Cook CB: Perceptions of resident physicians about management of inpatient hyperglycemia in an urban hospital. *J Hosp Med* 2009; 4(1):E1-E8.
13. Trepp R, Wille T, Wieland T, Reinhart WH: Diabetes-related knowledge among medical and nursing house staff. *Swiss Med Wkly*, 2010; 140(25-26):370-375.
14. Piaggese A, Bini L, Castro Lopez E, Giampietro O, Schipani E, Navalesi R. Knowledge on diabetes and performance among health professionals in non-diabetological departments. *Acta Diabetologica* 1993; 30(1): 25-28.
15. O'Brien SV, Michaels SE, Hardy KJ. A comparison of general nurses and junior doctors diabetes knowledge. *Prof Nurse* 2003; 18(5): 257-260.