Paediatric endocrinology curriculum content uniformity across medical schools in Southern Nigeria – Lecturers' report

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Abstract. The Medical and Dental Council of Nigeria (MDCN), the regulatory body for medical practice in Nigeria, provides the benchmark for minimum academic standards (BMAS). While it is expected that there will be differences across schools, the extent of this is unknown and the effect/impact it will have on future medical practice in Nigeria is unknown. This study aimed to evaluate the differences in undergraduate paediatric endocrinology contents across medical schools in southern Nigeria and to understand the factors that influence these differences. Seven paediatric endocrinology lecturers were interviewed, and they filled a questionnaire generated from the themes of the discussion. The themes included the contents of diabetes mellitus lectures, the level of participation lecturers allowed students in emergency room management of DKA, and the assessment methods. Lecture notes on diabetes mellitus (DM) were scored using ISPAD guidelines and the differences were analysed using Student's T test. The extent to which competence was assessed for students was also provided by the lecturers. Two lecturers had reduced contents in their DM lectures, compared to others, $p = 0.003$. Most lecturers did not consult the MDCN BMAS while preparing their lecture notes. This study highlights the differences in curriculum contents in Southern Nigeria medical schools for endocrinology training in paediatrics, and significant differences methods of training. These differences will hamper the core objectives of human capital development should the trend continue. It is recommended that uniform curriculum template that is acceptable to many to streamline training and medical practice.

Keywords: paediatric endocrinology curriculum · evaluation · uniformity · Nigeria

1 Introduction

The undergraduate medical student has 4 – 6 years to become grounded in a foundation of medicine and its practice in Nigeria and other countries in the world [7, 13, 14, 21, 26]. During this period, he/she is expected to learn basic and clinical medical sciences from lecturers who are also medical doctors or allied health professionals. In the clinical class, he/she gets skills and cognitive knowledge from different specialties with the potential of becoming a specialist in any of these fields. These years are only the beginning of a life-long process of learning should he continue in the path. The Medical and Dental Council of Nigeria (MDCN) regulates medical education in Nigeria in collaboration with the National Universities Commission (NUC) so that all medical schools are expected to align with the key objectives of the Benchmark for Minimum Academic Standards (BMAS) [14]. Paediatric education is expected to be delivered to learners who have undergone basic medical sciences and introductory clinical postings so the complexity of analysing and applying cognitive and psychomotor skills are not forced on a naïve mind and body [4, 15, 39]. The MDCN BMAS are a set of prescribed competencies and objectives that medical graduates must achieve before being allowed to practice and treat patients in Nigeria and probably abroad. These key competencies are usually not detailed but must be covered across the spectrum of medicine and the various universities are allowed to draw up their syllabuses based on their missions and visions. To the best of our knowledge, there is no literature on how the syllabus derived from this BMAS was developed in each school in Nigeria. In most cases, the syllabuses were created by individual lecturer(s) and then modified by others and approved by the faculty [40, 41]. With this method, there will be differences and these differences can mean different competencies in the graduating doctors.

There are various methods by which constructed syllabuses with their objectives and competences are delivered as prescribed by governing and regulatory bodies, and the differences which are perceived include but not limited to; (i) the class placements ie, which year particular disciplines will be taught, (ii) the rotation pattern through various specialties, (iii) what skills and when they should be taught, (iv) what subjects / topics medical schools teach to achieve the contents specified in the curriculum, (v) whether the disciplines are taught in blocks or staggered, and (vi) the availability of various training tools [13, 29, 30].

These real or apparent differences have not been evaluated today and their effect to the health system is yet unknown. Learning theories are expected to help lecturers decide which learning experience fits a particular competence. The social cognitive theory and behaviourist approach to learning posits that learning is a functioning of continuous, dynamic, reciprocal interactions and determined by personal, environmental, and behavioural [32]. Lecturers, in designing their teaching methods for particular skills are expected to take these principles into cognizance, so that learners are not unduly short changed or overburdened with tasks that may be unnecessary.

Despite the importance of clinical training in the medical education, marked variations abound in various schools [16, 37, 40]. The post graduate medical col-

leges have unified competency templates and logbooks, which are assessed but undergraduate medical schools do not have these unified competency templates making the variability even more marked [17, 30, 35, 40]. Some schools have special tools like clinical skills laboratories and use them, while others have the basic clinics out-patient, in patient wards, theatres and community outposts. Studies show that the new tools, even when available, are not properly or frequently used, based on compliance/ competence in teaching by the teachers [1, 8, 9, 44]. It is therefore possible that should MDCN conduct a general licensing examination, as done in the USA, UK [19, 39, 48] and for the foreign trained medical doctors in Nigeria, there could be very wide variations in the performance of candidates.

As emergencies are usually the common modes of presentation of patients in Nigeria and many other countries to the hospital, it is imperative that medical students get competency in the clerkship of a patient presenting to the emergency room [2, 38, 39]. The learning environment in that setting is however very tense and charged and learning may be limited unless there are specific competence and objectives the learners are scheduled to learn and retain. For this experiential learning to be perfected, lecturers must define objectives, competencies, timing, and environment for learning to occur, otherwise, learners may leave without achieving set goals and disturbing patients. Miller's pyramid can be used here also, and the learner knows how, and shows how and for the expert novice, does (figure 1) [20, 28, 36, 46]. If there is no prescribed mode of learning delivery, many skills may not be taught, and the competency compromised among graduating medical doctors. Lecturers then need to come together to evaluate the curriculum being used in their various schools and determine what is needed and what needs improvement.

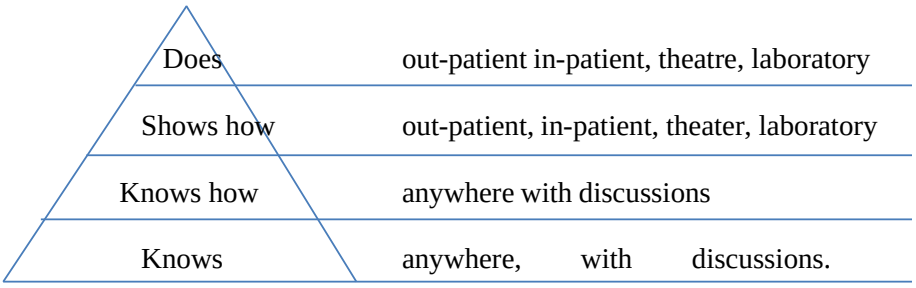

Fig. 1. Miller's pyramid of learning assessments and clinical settings for use.

Since there is possibility that variations exist in the curriculum used to train medical students in endocrinology, and that the variation can impact on the competencies and specific objectives these graduates achieve in different schools, we aimed primarily to check whether schools use the prescribed BMAS to design their curriculum in paediatric endocrinology and secondarily to evaluate the

contents of some paediatric endocrinology subjects/topics and the methods used to deliver these competencies. To understand what motivates individual lecturer to use specific methods to teach and the contents of their lectures, qualitative research serves the purpose as it allows collection of variety of empirical materials, describing routines, personal experiences, interactions so that superior arguments or methods can be agreed upon and put forward for others to use. The use of this type of data also allows for deep introspection during conversations and afterwards and the researchers have the opportunity of describing to the audience, what participants thought and their nuances to particular issues. This study will not only check if there are differences, but also why the differences exist.

2 Methodology

This was a cross sectional study design with qualitative and quantitative data analyses, evaluating the curriculum being used by various medical schools in Nigeria to deliver the MDCN/NUC paediatric endocrinology curriculum. The lecturers were invited via email and those who accepted the invitation were sent the zoom link for the meeting. The sample frame *eventually* was a 7-man paediatric endocrinology lecturer group from 7 different universities. With the aim of stimulating interaction among the group, the status of the group was heterogenous, as they consisted of professors, senior lecturers, male and female and range of teaching years. After the focus group discussion was conducted, a questionnaire survey based on the themes and findings of the focus group discussions was sent out to the lecturers, as a means generating more information and quantifying them. The participants were also required to send in their diabetes mellitus lecture notes for further evaluation to check content variability. One participant did not complete their survey, but the incomplete information retrieved was used since this was not an experimental research.

2.1 Focus group discussion and data collection

The principal investigator (Iroro Yarhere – IY) conducted the focus group discussion using the Zoom link sent to all participants on the 16th of October 2021, which lasted 2 hours and all participants were given opportunity to discuss freely. The topics were; the contents of their lectures in diabetes mellitus, diabetic keto acidosis; the methods of generating lecture contents and instructional designs; skills performance deliveries and assessments; and what they perceived was important to deliver to the learners, and why they believed this.

Participants were asked specific questions concerning the topics and made to discuss how learners under them were taught some skills for examples, what learners were allowed to do in the emergency room and how they assessed the competencies expected of them.

2.2 Quantitative analyses of the course content for diabetes

Knowing diabetes mellitus is one of the most important and prevalent endocrine diseases, the lecture notes from 6 institutions were interrogated to check differences in contents. Each item (sub-topics) in the notes were scored and a cumulative was derived for the institution. One of the lecturers did not provide their notes.

- ***Definition (4 points)***. The standard definition was based on that given by International Society for Pediatric and Adolescent Diabetes (ISPAD), which incorporated the complexity of the condition, chronic hyperglycaemia, and pathology of insulin deficiency (absolute or relative).
- ***Aetiology (4 points)***. The standard information about aetiology of diabetes is total insulin lack or relative insulin deficiency, and others.
- ***Epidemiology (4 points)***. The global epidemiology as noted in several WHO, UNICEF, and ISPAD publications with local contents (where available).
- ***Pathophysiology (6 points)***. The three major steps in pathogenesis of type 1 diabetes are, autoimmune destruction of the pancreatic islet (beta) cells mediated by viruses, with low insulin production and eventually reduced glucose uptake in cells leading to hyperglycaemia and its attendant cellular and tissue pathologies.
- ***Clinical features, investigation, differential diagnosis, complications, diabetic ketoacidosis, Somogyi and dawn effects, new technology, nutrition, education, prevention, and any other information (10 points)***. Data also consisted of the degree to which lecturers used various resources to develop their lecture notes and objectives, and the extent to which they believed some information were needed by the learners in their delivery of Disorders of sex development topic.

2.3 Data analyses

The focus group discussion data were analysed using the thematic framework content analyses method. Since the zoom meeting was recorded and downloaded into the computer, all notes and audio were listened to, and themes categorized. The transcription of the groups' discussions was reviewed by authors to help categorize the data and pull-out important quotes. The theme of the focus group discussion were identified during the course of transcribing but focus was placed on course contents, mode of instruction/ learning delivery and assessment. One theme represented a case in the quantitative data matrix so that, in discussing the content of diabetes mellitus, lecturers were then asked to submit their lecture notes on diabetes mellitus and comparison was done using the ISPAD guidelines. Differences in mean scores of diabetes mellitus differences was analysed using Student's t test. In reporting the findings, actual words were written down and the context to the words and phrases noted, checking for triggers to particular positions taken by participants. The illustrated differences and / or similarities

were used to highlight the main objectives of the study. The themes from the FGD were placed next to the quantitative data that was collected, to allow for a flow in the result.

2.4 Ethical considerations

The research commenced after the Research Ethics committee of the University of Port Harcourt granted approval (UPH/CEREMAD/REC/MM80/056) and all lecturers who participate in the survey gave informed consent. The participants were informed that they could opt out at any time of the discussion or completion of the survey, and they gave consent to recording the sessions.

3 Results

There were 5 females and 2 males, two of whom were professors, 3 were senior lecturers and 1 was a lecturer I. The age range was 40 – 60 years, and only 2 had formal training in medical education with certification. The thematic analyses of the focus group discussion extracted the following themes; lecture contents and skills training, modes of delivery of instructions and objectives, psychomotor skills training and perception of what important information and skills trainees were meant to achieve.

3.1 Lecture contents and mode of skills training

Taking diabetes mellitus as a case, many lecturers were of the view that basic knowledge was enough for the students, highlighting definitions, pathophysiology, clinical signs and symptoms, investigations and how to treat. The lectures series always had diabetes and diabetic keto acidosis since most of the patients will present in that manner. The emergency room treatment of DKA were mainly theoretical except for one institution that allowed some basic hands-on skills learning in the emergency room. However, some other institutions allowed for some of the skills to be learnt in the clinics with more stable patients. The lecture notes are occasionally graduated from students through residents and then fellows in subspecialist training, but it would seem some lecturers gave higher content to the undergraduate learners also. These were expressed in the quotes below.

Participant 1 (M.E): *"What I basically do is to introduce diabetes to them baseline information about diabetes, pathophysiology the clinical signs and symptoms and how you treat. Then the different modalities of treatment, the ones we do here and the optimal treatment that you would love to give. Then I also give them information about DKA because since that is the way most of our patients present... that they need to know how to handle DKA when patients come in unconscious, or even know symptoms that suggest they may be dealing with DKA. For me, that is the objective. The objective is that you want the students*

to recognize a child that has diabetes, one that has come in coma, need to do random blood glucose, which is now a prerequisite for all children in the emergency room."

Participant 2 (O.A): *"So, I do exactly what M.E does because we must remember that not all of the students will become paediatricians let alone endocrinologist. So, I give them the basic information about diabetes including the definition, epidemiology, clinical signs and symptoms of diabetes pathophysiology and treatment that it is available including insulin and diets."*

Participant 3 (U.C): *"When the patient comes in the emergency room, the emergency room team sees first as they are the first on call. They start the modalities of treatment even before inviting the endocrinology team... ... If the students are available, since they rotate through the emergency room, ... (we always assume some degree of dehydration in the child with DKA), I concentrate more on the principles of management, fluid, before we start insulin, and at the same time electrolyte correction. The students only basically stand and watch what to do. They don't get to take samples, but they can do urinalysis."* **Participant 2 (O.A)** cuts in ... *"In my centre, the students don't participate in emergency room. Most of those hands-on they get to do in the clinic since the patients in the clinic are more stable. However, if students have demonstrated "capacity", they are allowed to do some more advanced stuff like setting IV lines and regulate infusion."*

Total scores of diabetes lecture contents delivered in various institutions are shown in figure 2.

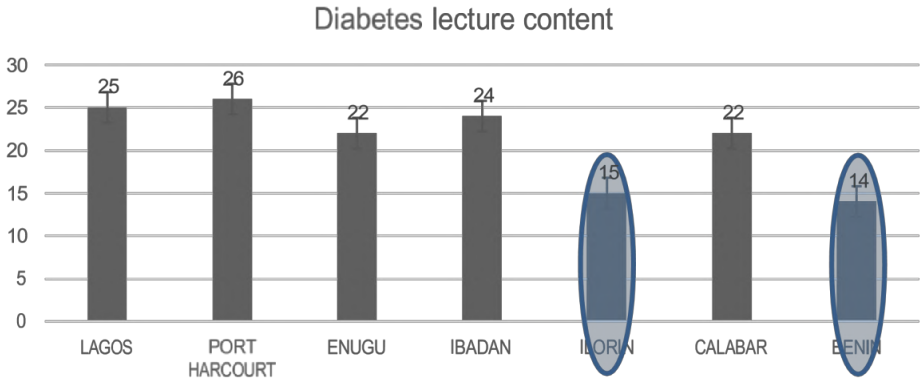

Fig. 2. Total scores of diabetes lecture contents delivered in various institutions.

The mean score for the 7 institutions was 21.14 ± 4.7, with a range of $14 - 26$. The difference in total scores between institutions was statistically significant, $t = 3.244, p = 0.003$. The centres whose lecturers believed only basic information should be given actually had the least scores.

Scrutinising this further, it was noticed that learners with reduced contents had longer teaching experience, unlike those who had more contents in their lecture notes (figure 3). Those centres with high scores for content had lecturers who trained under one mentor, so chances are that they followed a particular trend.

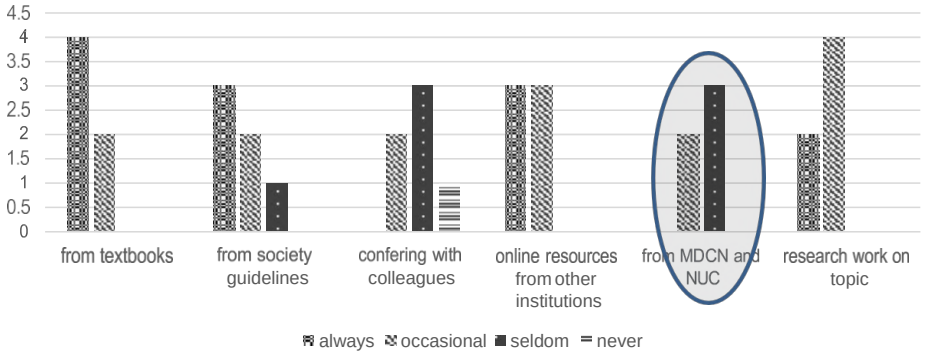

Fig. 3. Lecturers' report on sources of information when preparing lecture notes.

Two lecturers confer among themselves and possibly would have similarities in their notes, but more lecturers seldom consult the MDCN and NUC guidelines. Society guidelines like ESPE, ISPAD and PES as well as online resources appear to have higher consultations in lecture note preparations and this may be the reason for the high variability in the notes students receive from their lecturers. Not consulting the MDCN BMAS to prepare lecture notes by lecturers shows low level of compliance to the prescribed curriculum given by the regulatory body.

3.2 Lecturers' focus group discussion concerning modes of learning delivery

Participant 4 (O.O): *"So, in Ife town, there are two campuses, so students are either in Wesley Guild Hospital or in the OAUTH complex, and most endocrine patients are in the OAUTH complex. Students do emergency room, neonatal unit and 2 other sub-specialties. That would mean some students don't get to see endocrine patients."* **Participant 6 (E.O)** cuts in... *"what I tell my students is, be open and make sure you discuss with your colleagues so that any interesting patient that comes to the ward, you (the students) will see and learn from, irrespective of the fact that the patient is not in your group or unit as at the time of rotation."*

When a centre has 2 campuses and students have to rotate through them, there are already differences in the exposures the students experience within

that centre. This is rather in keeping with the diverse nature of medicine as many doctors will manage different diseases and have to learn as many during their training and in practice. It is unlikely that the more specialised endocrine cases will go to the outposts, so students who take their rotations mainly in the outposts are already at a disadvantage and may not encounter endocrine cases. Here also, asking students to be open to learning without giving intended learning outcomes can lead to content overload, and misdirection of efforts. No doubt andragogical learning styles are encouraged in advanced education, but this should be in the context of guided learning.

Participant 5 (E.I): *"While we conduct the didactic lectures for one month, students rotate through all subspecialty units in the department of paediatrics for 3 months (10 days in each unit). What is unlikely to happen is that all students will see children with DKA in the emergency room. However, they will see children with diabetes in the clinic and learn further, the routine management of diabetes. There is no particular structure in the clinic on what is taught to them, but they will learn the various types of insulin, see the difficulties in achieving controls and strategies of improving this."*

Participant 6 (E.O): *"There are many other fora through which diabetes is taught to the students including tutorial topics, where we teach them all aspects of diabetes, so those students who do not pass through my unit, get to see some of the management techniques we use."*

Participant 3 (U.C): *"It is the same as in LUTH, not all the students rotate through endocrinology. Our programme is divided into 8 weeks junior posting and 8 weeks senior posting, so our students are posted to different units but mainly to learn general paediatrics with little emphasis on the sub-specialty."*

"....when I returned from PETCWA, my senior colleagues said the ***idea of the curriculum is not to make endocrinologists of the students*** *but to have them get basic knowledge in endocrinology. I am therefore constrained to give only basic information and allow students learn only basic skills."*

3.3 Lecturers' focus group discussion on psychomotor training for learners

Psychomotor skills are needed for better care of patients and since many of the patients in paediatrics are tiny and tender, causing more harm during physical examination and procedures are rarely condoned by the parents and paediatricians, so allowing "novices" to practice on children may be quite an ask, which may inform the decisions of many trainers not to allow hands-on. However, there are means by which these can be circumvented including but not limited to skills laboratories and mannequins use, which many institutions have but not all trainers used them. **"How do you teach the students psychomotor skills?"**

Participant 4 (O.O): *"Psychomotor skills are taught mainly in the clinic. The skills lab is available, but I don't get to use them I must confess.... So, to teach psychomotor skills, we use stable patients in the clinics allowing students demonstrates signs and symptoms."*

"The skills labs have mannequins, but they are not tailored for endocrinology teaching, so I just take the weighing scales and stadiometer for them to learn how to take anthropometric measurements and then chart them."

Participant 5 (E.I): *"In my centre, students are allowed to assist house officers and residents in collecting samples, taking urine for analysis, monitoring patients, checking to vital signs and occasionally, help in setting IV lines. We even get to assign patients to individual students to monitor, and report feedbacks."*

"Our skills labs have videos which we recorded for physical examinations and basic skills like Oral glucose tolerance testing. After watching the videos, we ask students to make their own recording of the endocrine system examination."

Participant 3 (U.C): *"Most times I perform the tasks while the students watch, then I explain why the task is being done and the expected outcome. Afterwards, I allow the students perform the same task in the presence of everyone and make the other students critique what was done."*

Lecturers have the tendency to believe some cognitive and psychomotor skills should have been taught to students in their preclinical or basic clinical postings before ascending to the core clinical postings. It is for this reason that these lecturers will ask their students to perform a task and be frustrated when the students miss some steps or state categorically that they do not have the skills. Take participant 5 for example, who will ask the student to perform the task first before showing them how.

Participant 5 (E.I): *"In some cases, especially when the tasks are simple, like checking for jaundice, I ask the students to perform them in my presence and correct them immediately after. The problem is, for some examination skills, there are different techniques available and acceptable in eliciting examination findings, and the students may have been taught one, leaving another. So, in my opinion, it may be best to unify the various available techniques and the faculties should choose which one instruction will be acceptable in their institution."*

4 Discussion

This study has shown that there are differences in the course contents and methods of teaching in paediatric endocrinology curriculum in medical schools across southern Nigeria. Some lecturers agreed that they did not participate in the development of the curriculum used in their schools and were handed down a set of instructions, and told what to do. Surely not everyone can be in the curriculum implementation committees in their universities, but their inputs can be considered, especially if they already had some training in medical education [5, 22, 40]. This way also, lecturers will know what to teach learners, the degree of complexity and the competency that each class year needs. As exemplified by diabetes mellitus, students having varied understanding of the topic in their clinical years may not be in the best interest of the nation they hope to serve. In not conferring with colleagues to prepare lecture notes, and using different materials to source information, the differences in lecture contents are inevitable. The

experiences of the lecturers, lecturing style, type of presentation, audience and the subject of discourse usually determine the content and context of the lectures presented. [6, 8, 10, 25]. Clinical training in medical education consisting of in-patient, out-patient, theatres, and skills laboratory help learners achieve basic skills they will use to treat and manage patients [9, 23, 24]. One university had 2 clinical campuses where different patients are admitted, and learners rotate through these campuses based on the roster developed. This means students in different campuses are likely to encounter different diseases and will be exposed to different competencies. So even within and between schools, differences exist and assessing uniform competency will be difficult to achieve except templates are created for alignment. When these learners do not touch, talk to or participate in the management of patients in their emergency room, then opportunities to acquire competency and assess these may be lost [3, 18, 31, 42]. Though newer technologies of video recording of lectures, mannequins for skills are now available, not all schools have them, but they can be available for learners to receive the intended learning outcomes [36, 37]. To improve the interactive learning and promote better understanding, problem solving, and active learning can be introduced to students after receiving the didactic lectures. Students have however stated their constant need for Internet data, electrical power, and discipline to remain focused during the online lectures, which will prevent effective use of this learning tool [47].

Not allowing students participate in the immediate care of the sick patient in the emergency room limits their skills developments [12, 33, 45]. The departure from the social cognitive theory in this aspect of learning reduces the learners' competence to some extent and unless the lecturers have other means of remediating this within the time allotted for paediatric training, learners are likely going to be deficient in some key skills needed for practice as was noted in the study by Rakotz et al. [34]. No doubt paediatrics brings with it, the challenge of trying not to inflict more pain on an already sick infant, but the alternative of using mannequins and other gadget may not eventually transmit the needed skills for future practice [27].

While it is not possible to have all schools deliver the same contents for paediatric endocrinology courses and have uniform training methods for these intended learning outcomes, having them converge at a centre will surely improve the quality of graduates from each school. In the US and UK where licensing examinations are mandatory before doctors can practice [19, 48], there is the need to have all institutions prepare their learners with uniform learning packages before the board certifications. Should this happen in Nigeria and other African countries, graduating medical doctors will be of higher quality than they are at the moment. This will also reduce the variability in the assessment processes in the schools [11, 19, 43].

To achieve this uniformity in curriculum across medical schools, a Delphi or modified Delphi method can be used as done by Shah et al. [40] in Canada. The rigorous task of revising and refining objectives and competencies will be undertaken by the research team as suggested by the experts. Following this present

study, getting Nigerian and African paediatric endocrinologists and diabetologists to develop a common and consensus intended learning outcomes will set a stage for many other sub-specialties to do same and promote uniform syllabus with mild diversity, based on faculty strength. As is done for the post graduate medical education, alignment of curriculum and competency in the undergraduate medical education is needed in all clinical and non-clinical disciplines in Nigeria and other countries.

5 Conclusion

This study has highlighted that there are significant differences in paediatric endocrinology course contents and the ways these courses are delivered to the learners in various schools in Southern Nigeria. Some medical schools do not allow learners participate in patient care in the emergency room departing from the social cognitive learning theory. The reasons for the differences are the lack of communication between trainers/lecturers, not having full grasp of the MDCN curriculum and utilising same, preparing notes from many diverse sources and the perception that some activities were not needed at the stage of the medical students' development.

6 Recommendations

It is the recommendation of authors that a paediatric endocrinology trainer and indeed all trainers in paediatric and sub-specialties should undergo training course in medical education to learn the basic pedagogical and andragogical principles of learning while also understanding the concept of curriculum development and implementation. For core courses, it will be worthwhile for trainers to commission Delphi studies to develop curriculum that will help train the future doctors in Nigeria, in all disciplines of the profession.

7 Limitations

This study was done for only endocrinology topics in paediatrics and the extent to which it can be generalized is in doubts, as it is only confined to universities in Southern Nigeria. There is the possibility that other specialist disciplines align their curriculum in schools across Nigeria but with this study, many lecturers can have introspection and evaluate what is done within their disciplines and make recommendations also. The triangulating method of FGD and survey questionnaire, while not validating the information retrieved, explored issues related to similarities and differences in the curriculum by individual lecturers.

Acknowledgements. The authors acknowledge the lecturers who took time off their busy schedule to participate in the focus group discussions and for providing their lecture notes on diabetes mellitus.

Conflict of interest. The authors declare that they have no conflict of interest.

References

[1] Acton, R.D., Chipman, J.G., Lunden, M., Schmitz, C.C.: Unanticipated Teaching Demands Rise with Simulation Training: Strategies for Managing Faculty Workload. Journal of Surgical Education **72**(3), 522–529 (2015), ISSN 1931-7204, https://doi.org/10.1016/j.jsurg.2014.10.013

[2] Adler, M.D., Vozenilek, J.A., Trainor, J.L., Eppich, W.J., Wang, E.E., Beaumont, J.L., Aitchison, P.R., Erickson, T., Edison, M., McGaghie, W.C.: Development and Evaluation of a Simulation-Based Pediatric Emergency Medicine Curriculum. Academic Medicine **84**(7), 935–941 (July 2009), https://doi.org/10.1097/ACM.0b013e3181a813ca

[3] Al-Jahdali, H.H., Alharbi, A.S., Alabdulaali, S.K., Rajendram, R., Obaidi, M., Shirbini, N.: Do Ward Rounds Offer Effective Teaching and Training? Obstacles to Learning and What Makes Good Teaching in a Large Tertiary Care Hospital from Trainee Doctor's Perspective. American Journal of Respiratory and Critical Care Medicine **203**, A1528–A1528 (2021), https://doi.org/10.1164/ajrccm-conference.2021.203.1_MeetingAbstracts.A1528

[4] Badyal, D.K., Singh, T.: Learning Theories: The Basics to Learn in Medical Education. International Journal of Applied and Basic Medical Research **7**(Suppl 1), S1–S3 (December 2017), https://doi.org/10.4103/ijabmr.IJABMR_385_17

[5] Baral, K.P., Upadhyay, S.K., Bhandary, S., Gongal, R.N., Karki, A.: Development of Community Based Learning and Education system within Undergraduate Medical Curriculum of Patan Academy of Health Sciences. Journal of Nepal Health Research Council **14**(32), 58–65 (2016), URL http://jnhrc.com.np/index.php/jnhrc/article/view/726

[6] Benoit, L.J., Travis, C., Swan Sein, A., Quiah, S.C., Amiel, J., Gowda, D.: Toward a Bias-Free and Inclusive Medical Curriculum: Development and Implementation of Student-Initiated Guidelines and Monitoring Mechanisms at One Institution. Academic Medicine **95**(12S), S145–S149 (December 2020), https://doi.org/10.1097/ACM.0000000000003701

[7] Brass, L.F., Akabas, M.H.: The national MD-PhD program outcomes study: Relationships between medical specialty, training duration, research effort, and career paths. JCI Insight **4**(19) (10 2019), https://doi.org/10.1172/jci.insight.133009, URL https://insight.jci.org/articles/view/133009

[8] Brown, G., Manogue, M.: AMEE Medical Education Guide No. 22: Refreshing lecturing: a guide for lecturers. Medical Teacher **23**(3), 231–244 (2001), https://doi.org/10.1080/01421590120043000

[9] Bugaj, T.J., Nikendei, C.: Practical Clinical Training in Skills Labs: Theory and Practice. GMS Journal for Medical Education **33**(4), Doc63 (08 2016), https://doi.org/10.3205/zma001062

[10] Charlton, B.G.: Lectures are such an effective teaching method because they exploit evolved human psychology to improve learning. Medical Hypotheses

67(6), 1261–1265 (2006), ISSN 0306-9877, https://doi.org/10.1016/j.mehy.2006.08.001

[11] Chesser, A., Cameron, H., Evans, P., Cleland, J., Boursicot, K., Mires, G.: Sources of variation in performance on a shared OSCE station across four UK medical schools. Medical Education **43**(6), 526–532 (2009), https://doi.org/10.1111/j.1365-2923.2009.03370.x

[12] Clearihan, L., McGarry, H., Cheng, M., Bratuskins, P., Rowe, M.: Linking the RACGP curriculum to vocational education. Australian Family Physician **39**(11), 869–874 (November 2010)

[13] Devine, O.P., Harborne, A.C., Horsfall, H.L., Joseph, T., Marshall-Andon, T., Samuels, R., Kearsley, J.W., Abbas, N., Baig, H., Beecham, J., Benons, N., Caird, C., Clark, R., Cope, T., Coultas, J., Debenham, L., Douglas, S., Eldridge, J., Hughes-Gooding, T., Jakubowska, A., Jones, O., Lancaster, E., MacMillan, C., McAllister, R., Merzougui, W., Phillips, B., Phillips, S., Risk, O., Sage, A., Sooltangos, A., Spencer, R., Tajbakhsh, R., Adesalu, O., Aganin, I., Ahmed, A., Aiken, K., Akeredolu, A.S., Alam, I., Ali, A., Anderson, R., Ang, J.J., Anis, F.S., Aojula, S., Arthur, C., Ashby, A., Ashraf, A., Aspinall, E., Awad, M., Yahaya, A.M.A., Badhrinarayanan, S., Bandyopadhyay, S., Barnes, S., Bassey-Duke, D., Boreham, C., Braine, R., Brandreth, J., Carrington, Z., Cashin, Z., Chatterjee, S., Chawla, M., Chean, C.S., Clements, C., Clough, R., Coulthurst, J., Curry, L., Daniels, V.C., Davies, S., Davis, R., De Waal, H., Desai, N., Douglas, H., Druce, J., Ejamike, L.N., Esere, M., Eyre, A., Fazmin, I.T., Fitzgerald-Smith, S., Ford, V., Freeston, S., Garnett, K., General, W., Gilbert, H., Gowie, Z., Grafton-Clarke, C., Gudka, K., Gumber, L., Gupta, R., Harlow, C., Harrington, A., Heaney, A., Ho, W.H.S., Holloway, L., Hood, C., Houghton, E., Houshangi, S., Howard, E., Human, B., Hunter, H., Hussain, I., Hussain, S., Jackson-Taylor, R.T., Jacob-Ramsdale, B., Janjuha, R., Jawad, S., Jelani, M., Johnston, D., Jones, M., Kalidindi, S., Kalsi, S., Kalyanasundaram, A., Kane, A., Kaur, S., Al-Othman, O.K., Khan, Q., Khullar, S., Kirkland, P., Lawrence-Smith, H., Leeson, C., Lenaerts, J.E.R., Long, K., Lubbock, S., Burrell, J.M.D., Maguire, R., Mahendran, P., Majeed, S., Malhotra, P.S., Mandagere, V., Mantelakis, A., McGovern, S., Mosuro, A., Moxley, A., Mustoe, S., Myers, S., Nadeem, K., Nasseri, R., Newman, T., Nzewi, R., Ogborne, R., Omatseye, J., Paddock, S., Parkin, J., Patel, M., Pawar, S., Pearce, S., Penrice, S., Purdy, J., Ramjan, R., Randhawa, R., Rasul, U., Raymond-Taggert, E., Razey, R., Razzaghi, C., Reel, E., Revell, E.J., Rigbye, J., Rotimi, O., Said, A., Sanders, E., Sangal, P., Grandal, N.S., Shah, A., Shah, R.A., Shotton, O., Sims, D., Smart, K., Smith, M.A., Smith, N., Sopian, A.S., South, M., Speller, J., Syer, T.J., Ta, N.H., Tadross, D., Thompson, B., Trevett, J., Tyler, M., Ullah, R., Utukuri, M., Vadera, S., Van Den Tooren, H., Venturini, S., Vijayakumar, A., Vine, M., Wellbelove, Z., Wittner, L., Yong, G.H.K., Ziyada, F., McManus, I.C.: The Analysis of Teaching of Medical Schools (AToMS) survey: an analysis of 47,258 timetabled teaching events in 25 UK medical schools relating to timing, duration, teaching formats, teaching content, and problem-based learning. BMC Medicine **18**(1), 126

(May 2020), ISSN 1741-7015, https://doi.org/10.1186/s12916-020-01571-4

[14] Federal Ministry of Health of Nigeria, Health Systems 20/20 Project: Nigeria Undergraduate Medical and Dental Curriculum Template, 2012. Health Systems 20/20 project, Abt Associates Inc., Bethesda, MD (2012), URL https://www.hfgproject.org/nigeria-undergraduate-medical-dental-curriculum-template/

[15] Flynn, L., Jalali, A., Moreau, K.A.: Learning theory and its application to the use of social media in medical education. Postgraduate Medical Journal **91**(1080), 556–560 (2015), ISSN 0032-5473, https://doi.org/10.1136/postgradmedj-2015-133358, URL https://pmj.bmj.com/content/91/1080/556

[16] Fuchs, M.A., Schwartz, A.W., Caton, J.B., Gooding, H., Richards, J.B.: Defining Student-as-Teacher Curricula in the Absence of National Guidelines: An Innovative Model. Academic Medicine **97**(6), 832–838 (June 2022), https://doi.org/10.1097/ACM.0000000000004589

[17] George, J.T., Warriner, D.A., Anthony, J., Rozario, K.S., Xavier, S., Jude, E.B., McKay, G.A.: Training tomorrow's doctors in diabetes: self-reported confidence levels, practice and perceived training needs of post-graduate trainee doctors in the UK. A multi-centre survey. BMC Medical Education **8**(1), 22 (Apr 2008), ISSN 1472-6920, https://doi.org/10.1186/1472-6920-8-22

[18] Gray, A.Z., Modak, M., Connell, T., Enright, H.: Structuring ward rounds to enhance education. The Clinical Teacher **17**(3), 286–291 (2020), https://doi.org/10.1111/tct.13086

[19] Hope, D., Kluth, D., Homer, M., Dewar, A., Fuller, R., Cameron, H.: Variation in performance on common content items at UK medical schools. BMC Medical Education **21**(1), 323 (Jun 2021), ISSN 1472-6920, https://doi.org/10.1186/s12909-021-02761-1

[20] Huba, M.E., Freed, J.E.: Learner-Centered Assessment on College Campuses: Shifting the Focus from Teaching to Learning. Allyn and Bacon (2000)

[21] Humphris, G.M., Kaney, S.: Assessing the development of communication skills in undergraduate medical students. Medical Education **35**(3), 225–231 (2001), https://doi.org/10.1111/j.1365-2923.2001.00869.x, URL https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1365-2923.2001.00869.x

[22] Kirton, O.C., Reilly, P., Staff, I., Burns, K.: Development and Implementation of an Interactive, Objective, and Simulation-Based Curriculum for General Surgery Residents. Journal of Surgical Education **69**(6), 718–723 (2012), ISSN 1931-7204, https://doi.org/10.1016/j.jsurg.2012.05.010

[23] Kneebone, R., Nestel, D.: Learning and teaching clinical procedures. In: Dornan, T., Mann, K., Scherpbier, A., Spencer, J. (eds.) Medical Education: Theory and Practice, pp. 171 – 191, Elsevier, Netherlands (2011), ISBN 9780702035227, URL https://csds.qld.edu.au/sdc/Provectus/AusSETT_elective/E4%20-%20Patient%20focused%20simulations%20(Hybrid%20simulations)/newUnit/files/2%20Kneebone%20and%20nestel,%202010%20in%20Dornan%20Learning%20&%20Teaching.pdf

[24] Leinster, S.: Learning in the clinical environment. Medical Teacher **31**(2), 79–81 (2009), https://doi.org/10.1080/01421590902744936

[25] Long, A., Lock, B.: Lectures and large groups, chap. 10, pp. 137–148. John Wiley & Sons, Ltd (2013), ISBN 9781118472361, https://doi.org/10.1002/9781118472361.ch10

[26] Magennis, P., Begley, A., Douglas, J., Dhariwal, D.K.: Duration of specialty training in Oral and Maxillofacial Surgery in the United Kingdom for trainees joining the OMFS specialist list between 2002 and 2019. British Journal of Oral and Maxillofacial Surgery **58**(10), 1282–1290 (2020), ISSN 0266-4356, https://doi.org/10.1016/j.bjoms.2020.09.023

[27] Mass, P.N., Contento, J.M., Opfermann, J.D., Sumihara, K., Kumthekar, R.N., Berul, C.I.: An infant phantom for pediatric pericardial access and electrophysiology training. Heart Rhythm O2 **3**(3), 295–301 (2022), ISSN 2666-5018, https://doi.org/10.1016/j.hroo.2022.02.010

[28] McLachlan, J.C.: The relationship between assessment and learning. Medical Education **40**(8), 716–717 (2006), https://doi.org/10.1111/j.1365-2929.2006.02518.x

[29] McManus, I.C.: Medical school differences: beneficial diversity or harmful deviations? BMJ Quality & Safety **12**(5), 324–325 (2003), ISSN 1475-3898, https://doi.org/10.1136/qhc.12.5.324, URL https://qualitysafety.bmj.com/content/12/5/324

[30] McManus, I.C., Harborne, A.C., Horsfall, H.L., Joseph, T., Smith, D.T., Marshall-Andon, T., Samuels, R., Kearsley, J.W., Abbas, N., Baig, H., Beecham, J., Benons, N., Caird, C., Clark, R., Cope, T., Coultas, J., Debenham, L., Douglas, S., Eldridge, J., Hughes-Gooding, T., Jakubowska, A., Jones, O., Lancaster, E., MacMillan, C., McAllister, R., Merzougui, W., Phillips, B., Phillips, S., Risk, O., Sage, A., Sooltangos, A., Spencer, R., Tajbakhsh, R., Adesalu, O., Aganin, I., Ahmed, A., Aiken, K., Akeredolu, A.S., Alam, I., Ali, A., Anderson, R., Ang, J.J., Anis, F.S., Aojula, S., Arthur, C., Ashby, A., Ashraf, A., Aspinall, E., Awad, M., Yahaya, A.M.A., Badhrinarayanan, S., Bandyopadhyay, S., Barnes, S., Bassey-Duke, D., Boreham, C., Braine, R., Brandreth, J., Carrington, Z., Cashin, Z., Chatterjee, S., Chawla, M., Chean, C.S., Clements, C., Clough, R., Coulthurst, J., Curry, L., Daniels, V.C., Davies, S., Davis, R., De Waal, H., Desai, N., Douglas, H., Druce, J., Ejamike, L.N., Esere, M., Eyre, A., Fazmin, I.T., Fitzgerald-Smith, S., Ford, V., Freeston, S., Garnett, K., General, W., Gilbert, H., Gowie, Z., Grafton-Clarke, C., Gudka, K., Gumber, L., Gupta, R., Harlow, C., Harrington, A., Heaney, A., Ho, W.H.S., Holloway, L., Hood, C., Houghton, E., Houshangi, S., Howard, E., Human, B., Hunter, H., Hussain, I., Hussain, S., Jackson-Taylor, R.T., Jacob-Ramsdale, B., Janjuha, R., Jawad, S., Jelani, M., Johnston, D., Jones, M., Kalidindi, S., Kalsi, S., Kalyanasundaram, A., Kane, A., Kaur, S., Al-Othman, O.K., Khan, Q., Khullar, S., Kirkland, P., Lawrence-Smith, H., Leeson, C., Lenaerts, J.E.R., Long, K., Lubbock, S., Burrell, J.M.D., Maguire, R., Mahendran, P., Majeed, S., Malhotra, P.S., Mandagere, V., Mantelakis, A., McGovern, S., Mosuro, A., Moxley, A., Mustoe, S., Myers, S., Nadeem, K., Nasseri, R.,

Newman, T., Nzewi, R., Ogborne, R., Omatseye, J., Paddock, S., Parkin, J., Patel, M., Pawar, S., Pearce, S., Penrice, S., Purdy, J., Ramjan, R., Randhawa, R., Rasul, U., Raymond-Taggert, E., Razey, R., Razzaghi, C., Reel, E., Revell, E.J., Rigbye, J., Rotimi, O., Said, A., Sanders, E., Sangal, P., Grandal, N.S., Shah, A., Shah, R.A., Shotton, O., Sims, D., Smart, K., Smith, M.A., Smith, N., Sopian, A.S., South, M., Speller, J., Syer, T.J., Ta, N.H., Tadross, D., Thompson, B., Trevett, J., Tyler, M., Ullah, R., Utukuri, M., Vadera, S., Van Den Tooren, H., Venturini, S., Vijayakumar, A., Vine, M., Wellbelove, Z., Wittner, L., Yong, G.H.K., Ziyada, F., Devine, O.P.: Exploring UK medical school differences: the MedDifs study of selection, teaching, student and F1 perceptions, postgraduate outcomes and fitness to practise. BMC Medicine **18**(1), 136 (May 2020), ISSN 1741-7015, https://doi.org/10.1186/s12916-020-01572-3

[31] Melo Prado, H., Hannois Falbo, G., Rodrigues Falbo, A., Natal Figueirôa, J.: Active learning on the ward: outcomes from a comparative trial with traditional methods. Medical Education **45**(3), 273–279 (2011), https://doi.org/10.1111/j.1365-2923.2010.03846.x

[32] Morris, C.: Work-based Learning. In: Understanding Medical Education, chap. 12, pp. 163–177, John Wiley & Sons, Ltd (2018), ISBN 9781119373780, https://doi.org/10.1002/9781119373780.ch12

[33] Nundy, S., Kakar, A., Bhutta, Z.A.: Bedside Teaching in Developing Countries. In: How to Practice Academic Medicine and Publish from Developing Countries? A Practical Guide, pp. 369–378, Springer Nature Singapore, Singapore (2022), ISBN 978-981-16-5248-6, https://doi.org/10.1007/978-981-16-5248-6_39

[34] Rakotz, M.K., Townsend, R.R., Yang, J., Alpert, B.S., Heneghan, K.A., Wynia, M., Wozniak, G.D.: Medical students and measuring blood pressure: Results from the American Medical Association Blood Pressure Check Challenge. The Journal of Clinical Hypertension **19**(6), 614–619 (2017), https://doi.org/10.1111/jch.13018

[35] Rickard, J.: Systematic Review of Postgraduate Surgical Education in Low- and Middle-Income Countries. World Journal of Surgery **40**(6), 1324–1335 (Jun 2016), ISSN 1432-2323, https://doi.org/10.1007/s00268-016-3445-x

[36] Roberts, D.H., Newman, L.R., Schwartzstein, R.M.: Twelve tips for facilitating Millennials' learning. Medical Teacher **34**(4), 274–278 (2012), https://doi.org/10.3109/0142159X.2011.613498, URL https://www.utoledo.edu/med/md/curriculum/pdfs/Twelve%20tips%20for%20facilitating%20millennial%20learning.pdf

[37] Roberts, D.H., Schwartzstein, R.M., Weinberger, S.E.: Career Development for the Clinician–Educator. Optimizing Impact and Maximizing Success. Annals of the American Thoracic Society **11**(2), 254–259 (2014), https://doi.org/10.1513/AnnalsATS.201309-322OT

[38] Salas, E., Rosen, M.A., King, H.: Managing teams managing crises: principles of teamwork to improve patient safety in the Emergency Room and beyond. Theoretical Issues in Ergonomics Science **8**(5), 381–394 (2007), https://doi.org/10.1080/14639220701317764

[39] Schumacher, D.J., Englander, R., Carraccio, C.: Developing the Master Learner: Applying Learning Theory to the Learner, the Teacher, and the Learning Environment. Academic Medicine **88**(11), 1635–1645 (Nov 2013), https://doi.org/10.1097/ACM.0b013e3182a6e8f8

[40] Shah, S., McCann, M., Yu, C.: Developing a National Competency-Based Diabetes Curriculum in Undergraduate Medical Education: A Delphi Study. Canadian Journal of Diabetes **44**(1), 30–36.e2 (2020), ISSN 1499-2671, https://doi.org/10.1016/j.jcjd.2019.04.019

[41] Sharma, M., Murphy, R., Doody, G.A.: Do we need a core curriculum for medical students? A scoping review. BMJ Open **9**(8), e027369 (2019), ISSN 2044-6055, https://doi.org/10.1136/bmjopen-2018-027369, URL https://bmjopen.bmj.com/content/9/8/e027369

[42] Tariq, M., Motiwala, A., Ali, S.U., Riaz, M., Awan, S., Akhter, J.: The learners' perspective on internal medicine ward rounds: a cross-sectional study. BMC Medical Education **10**(1), 53 (Jul 2010), ISSN 1472-6920, https://doi.org/10.1186/1472-6920-10-53

[43] Taylor, C.A., Gurnell, M., Melville, C.R., Kluth, D.C., Johnson, N., Wass, V.: Variation in passing standards for graduation-level knowledge items at UK medical schools. Medical Education **51**(6), 612–620 (2017), https://doi.org/10.1111/medu.13240

[44] Tran, T.Q., Scherpbier, A., van Dalen, J., van Do, D., Wright, E.P.: Implementing a skillslab training program in a developing country. Education for Health **27**(3), 243–248 (2014), https://doi.org/10.4103/1357-6283.152181, URL https://educationforhealth.net//article.asp?issn=1357-6283;year=2014;volume=27;issue=3;spage=243;epage=248;aulast=Tran;t=6

[45] Walton, J.M., Steinert, Y.: Patterns of interaction during rounds: implications for work-based learning. Medical Education **44**(6), 550–558 (2010), https://doi.org/10.1111/j.1365-2923.2010.03626.x

[46] Webber, K.L., Tschepikow, K.: Learner-Centered Assessment: A Comparison of Faculty Practices in US Colleges and Universities 1993 to 2004. In: 51st Annual Forum of the Association for Institutional Research (Toronto, Ontario, May 21-25, 2011) (2011), URL https://eric.ed.gov/?id=ED531715

[47] Yarhere, I.E., Obuzor, I.O., Fomsi, E.: Online Learning Using Google Classroom: Undergraduate Medical Students and Paediatric Residents Perspectives in the University of Port Harcourt, Nigeria. International Journal of TROPICAL DISEASE & Health **41**(18), 8–15 (Dec 2020), https://doi.org/10.9734/ijtdh/2020/v41i1830376, URL https://journalijtdh.com/index.php/IJTDH/article/view/1022

[48] van Zanten, M., Boulet, J.R., Shiffer, C.D.: Making the grade: licensing examination performance by medical school accreditation status. BMC Medical Education **22**(1), 36 (Jan 2022), ISSN 1472-6920, https://doi.org/10.1186/s12909-022-03101-7