



## Assessment of the knowledge and practice of pediatric pharmacy among hospital pharmacists in Delta State, Nigeria

Ufuoma Shalom AHWINAHWI<sup>1\*</sup>, Omotejohwo Emily OKOLOSI-PATANI<sup>2</sup>, Chimamaka Immaculata CHIMA<sup>1</sup>

<sup>1</sup>Department of Clinical Pharmacy and Pharmacy Administration; <sup>2</sup>Department of Pharmaceutical Microbiology and Biotechnology; Faculty of Pharmacy, Delta State University, Abraka, Nigeria.

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### Abstract

The importance of pediatric pharmacy practice cannot be overemphasized in a country with high morbidity in children. This study assessed the knowledge and practice of pediatric pharmacy among hospital pharmacists, Delta State, Nigeria. A cross-sectional study of hospital pharmacists from 10 randomly selected hospitals was done with the aid of a self-administered questionnaire. Fifty-two of the 90 (57.8%) questionnaires were analyzed, 41 (78.8%) respondents had pediatric units in their facilities and 6 (11.5%) had undertaken specialized courses in pediatric pharmacy. The overall knowledge score of pediatric pharmacy among the respondents was 48%. Forty-seven (90.4%) knew children handle medicines differently from adults, 45 (86.5%) knew young and older children respond to medicines differently. Forty-three (82.7%) respondents provided incorrect responses on oral absorption of rifampicin and phenobarbitone and 39 (75.0%) for penicillins; 49 (94.2%) lacked knowledge as to whether weight is the most accurate method of dosage calculation. Nineteen (36.5%) had dispensed unlicensed medicines, 47 (90.4%) had engaged in extemporaneous preparation, 41 (78.9%) had access to pediatric-tailored drug information sources and at least 38 (73.1%) could advice on measurement of small volumes of oral dosage formulation. Overall knowledge of the respondents was below average score but practice was nonetheless encouraging.

*Keywords:* Hospital pharmacists, Knowledge, Pediatric, Practice

### INTRODUCTION

Pediatric pharmacy which ensures the safe and effective use of medicines in persons within the pediatric age range of 0-18 years as specified by the WHO [1], is an emerging area of specialization in Nigeria. Its importance cannot be overemphasized in a country with high morbidity and mortality in children because medicines use is a major way of managing illnesses. Children make up a major

proportion of the population in Nigeria [2] and comprise the majority of those who seek medical care in healthcare facilities. Pharmacists are major contributors to the continuum of patient care ensuring they obtain optimum benefits from the use of medications. Having pediatric patients as a major group of persons to which pharmaceutical care is provided in hospitals demands that the pharmacist is poised to provide pediatric-

\*Correspondence. E-mail: [ushaloma@yahoo.com](mailto:ushaloma@yahoo.com) Tel: +234-8084867230.

tailored care to this group of patients. Pediatric patients are a special population group because of their immature organ development and special drug disposition pattern [3] which affect drug handling. Furthermore, some drugs are unlicensed while some are used off-label in this population due to the non-inclusion of children in clinical trials until recently [4]. Previous studies established the need to include more pediatric courses in the undergraduate pharmacy curriculum [5-7], especially because the majority of pharmacists in Nigerian hospitals do not require more than the undergraduate pharmacy degree to practice. The knowledge and skill set needed to execute the basic pediatric pharmacy practice are essential in view of the number of pediatric patients encountered by hospital pharmacists in their practice. Studies have surveyed the level of pharmacists' knowledge, awareness, practice and/or attitude toward pediatric patients, but these reports focused on community pharmacists [8,9] and final-year pharmacy students [6,10]. A Palestinian study recommended increasing pharmacists' awareness in providing care to pediatric patients through continuing education [11]. A Jordanian study also reported a lack of pharmacists' knowledge in their ability to handle pediatric patients [7]. Community pharmacists in Ontario, Canada had reported variable levels of perceived comfort, confidence and knowledge in providing care for children with substantial proportion tending towards non-comfort with the prescriptions [8] while only a small proportion of pharmacists practicing in a community or home care setting in Detroit had expertise or knowledge in selected pediatric topics [12]. Studies on the knowledge and practice of pediatric pharmacy by hospital pharmacists in Nigeria are scarce. This study therefore assessed the knowledge and practice of pediatric pharmacy among hospital pharmacists in Delta state, Nigeria.

## METHODS

**Study design and settings.** This was a cross-sectional study done in public hospitals in Delta State. A Federal medical centre, State-owned teaching hospital, four Central hospitals and three General hospitals were randomly chosen for the study.

**Study population.** Hospital pharmacists in Delta State involved in drug dispensing to patients in the selected hospitals were included in the study. Pharmacists who were interns and undergoing the mandatory National Youth Service Corps (NYSC) posting were excluded. A total of 90 pharmacists working at these facilities were included in the study.

**Survey instrument.** Structured questionnaire modified from one previously employed in a similar study [6] was used. The modified questionnaire consisted of 35 items and was divided into 3 sections: section A comprised pharmacists' demographic data and their involvement in pediatric pharmacy, section B comprised items on the knowledge of pharmacists on pediatric pharmacy, and section C was on the practice of pediatric pharmacy. Socio-demographic information obtained were age, gender, marital status, qualification(s), and years of practice. Information about their involvement in pediatric pharmacy was obtained with items which included "Do you engage in dispensing of pediatric prescriptions in your facility?", "Have you ever participated in any specialized course in pediatric pharmacy?" Fourteen items which determined knowledge contained close-ended and open-ended questions with the close-ended responses having 'Yes', 'No' and 'Not sure' responses. Open-ended knowledge questions included "What are unlicensed medicines?", "What do you understand by off-label use of medicines?" "Mention two common diseases in pediatrics in the tropics" and "Mention two pediatric tailored drug information sources".

Practice questions were close-ended questions with a Yes or No response. Three

practice case scenarios were also used to determine their practice skills and these were:

Practice Case Scenario 1. A caregiver needs to administer a dose of 1.5ml of amoxicillin/clavulanic acid to a pediatric patient. The measuring vial supplied by the drug manufacturer is calibrated in 2.5ml and 5ml. How do you ensure the right dose is administered?

Practice Case Scenario 2. Vitamin A 100,000 IU was prescribed to a 10-month-old infant. The only Vitamin A preparation available in the pharmacy is a soft-gel capsule. How would you ensure the patient gets maximum benefit from consulting with the doctor?

Practice Case Scenario 3: "Pedin" an oral drug with a high therapeutic index is available in 15mg/ml. How many milliliters should be most suitable for a 13.2kg body weight child if the pediatric dose is 2mg/kg?

Practice case scenarios 1 and 2 had multiple responses while Practice Case Scenario 3 involved dosage calculation.

The questionnaire was first pre-tested among five hospital pharmacists not included in the study to ascertain clarity and then self-administered on pharmacists in the randomly selected hospitals.

**Data analysis.** Correct answers on knowledge questions were awarded a score of 1, and 0 for an incorrect or unsure response. Items which had two answers were scored  $\frac{1}{2}$  each with maximum score for each individual expressed as a fraction of 14 which is the total number of items on knowledge. The practice of pediatric pharmacy was also assessed by scoring 1 for each positive response and 0 for a negative response. Practice case scenarios were reported by presenting the frequencies of responses. The overall mean score for the population was calculated by finding the mean of the total scores of all respondents expressed either in decimal fraction or percentage and compared with standards used in a previous Knowledge study [13]. Data were analysed using descriptive statistics such as means and frequencies, analysis was done with the aid of the Statistical Package for Social Sciences (SPSS, version 23.0)

**Ethical consideration.** Ethical approval for the study was obtained from the Central Hospital, Warri CHW/ECC VOL1/246, while written informed consent was obtained from each respondent. The respondents were assured of the confidentiality of their information and its use for research purposes only.

## RESULTS

A total of 90 questionnaires were distributed and 52 (57.7%) were analyzed, others were either not retrieved or incompletely filled. Females, 30 (57.7%) were more in number. More than half of the respondents were married 38 (73.1%) and the majority, 43 (82.7%) had a first degree in pharmacy. The majority of the respondents, 36 (69.2%) had less than ten years of practice as pharmacists. Details of the respondents' socio-demographics are presented in Table 1.

**Hospital Pharmacists' involvement in Pediatric Pharmacy.** Almost all, 50 (96.2%) respondents had engaged in dispensing prescriptions to pediatric patients, 41 (78.8%) had pediatric units in their facilities and 23 (44.2%) worked in those pediatric pharmacy units. Only 6 (11.5%) had taken specialized courses in pediatric pharmacy.

**Self-Reported Knowledge of Hospital Pharmacists.** The overall mean (SD) knowledge score was  $48\% \pm 13$ . Majority, (47, 90.4%) of the respondents were better knowledgeable in the item "Children handle medicines differently from adults" and 49 (94.2) lack knowledge on whether "weight is the most accurate method of dose calculation". A little more than half of the respondents (30, 57.7%), responded in the affirmative to the items "children are just like adults" and "intramuscular route is preferred to rectal route in children". Frequencies of correct and incorrect responses to the knowledge items are shown in Table 3.

**Hospital pharmacists' pediatric pharmacy practice.** Responding to questions on their practice of pediatric pharmacy, 19 (36.5%) had dispensed unlicensed medicines to pediatric patients, 47 (90.4%) had engaged in extemporaneous dispensing, 51 (98.1%) stocked dosage forms suitable for their patient while 41 (78.9%) had access to pediatric – tailored drug information. Details are as shown in Table 4.

### Practice Case Scenario 1.

Thirty-eight (73.1%) respondents would suggest the provision of an oral syringe with lower volume calibration, 6(11.5%)

respondents were either not sure of what to do or had no response. Details of all responses to this practice case scenario are shown in table 5.

### Practice Case Scenarios 2.

For this Practice case scenario, 25 (48.1%) respondents would encourage the caregiver to squeeze the soft-gel capsule into the child's mouth, 10(19.2%) did not respond and others had responses as shown in table 6.

### Practice Case Scenario 3

Twenty-five (48.1%) did not respond and 24(46.2%) got the correct dosage calculation. Details are shown in table 7.

**Table 1.** Socio demographic variable of respondents

Variables		Frequency (%) [N=52]
Age distribution (years)	21 – 30	10 (19.2)
	31-40	19(36.5)
	41 -50	12(23.1)
	Greater than 50	2(3.9)
	Unspecified	9(17.3)
Gender	Male	22(42.3)
	Female	30(57.7)
Marital status	Single	13(25.0)
	Married	38(73.1)
Qualifications	Undergraduate degree	43(82.7)
	Undergraduate and professional fellowship	4(7.7)
	Undergraduate and postgraduate pharmacy	2(3.9)
	Undergraduate, postgraduate and professional fellowship	3 (5.8)
Years of practice as a hospital pharmacist	1 – 5	23 (44.2)
	6 – 10	13 (25.0)
	11 – 15	10 (19.2)
	16 and above	6 (11.5)

**Table 2:** Hospital Pharmacists involvement in Pediatric Pharmacy

Questions	Yes (%)	No (%)
Do you engage in dispensing pediatric prescriptions in your facility?	50 (96.2)	2 (3.8)
Is there a pediatrics pharmacy unit in your facility?	41 (78.8)	11 (21.2)
If yes, do you work there?	23(44.2)	29(55.8)
Have you ever participated in any specialized courses in pediatric pharmacy?	6(11.5)	46(88.5)

**Table 3:** Self-reported Knowledge of Hospital Pharmacists about Pediatric Pharmacy (N=52)

Items	Correct responses (%)	Incorrect responses (%)
Children are like adults you need to give them small doses of medicines	30(57.7)	22(42.3)
Children handle medicines differently from adults	47(90.4)	5(9.6)
Young children and older ones respond to medicines in the same way	45(86.5)	7(13.5)
Range of illness in children is the same as in adults	6(11.5)	46(88.5)
Oral absorption of penicillin is higher in infants than in adults	13(25.0)	39(75.0)
Oral absorption of rifampicin and phenobarbitone is higher in infants than in adults	9(17.3)	43(82.7)
Percutaneous absorption is lower in infants than in adults	17(32.7)	35(67.3)
Intramuscular route of drug administration is preferred to rectal route in neonates and infants	30(57.7)	22(42.3)
Weight method is a more accurate method of dosage calculations in pediatrics	3(5.8)	49(94.2)
Medication errors in children have a higher potential to cause harm than in adults	47(90.4)	5(9.6)
What are unlicensed medicines?	35(67.3)	17(32.7)
What do you understand by off-label use of medicines?	34(65.4)	18(34.6)
*Two pediatric-tailored information sources are?	22.5(43.3)	29.5(56.7)
*Two common diseases in pediatrics in the tropics are	39.5(76.0)	12.5(24.0)

\*This item had two responses; the two correct response is scored as 1 while one correct question is scored as ½ score.

**Table 4:** Hospital Pharmacists practice of pediatric pharmacy

Items	Yes (%)	No (%)	No response /Not sure (%)
Have you ever dispensed an unlicensed medicine to a pediatric patient	19(36.5)	25(48.1)	8 (15.4)
Have you ever dispensed a drug to your patient off-label	30(57.7)	15(28.8)	7(13.5)
Do you engage in extemporaneous dispensing for pediatric patients at your facility?	47(90.4)	3(5.8)	2(3.9)
Do you stock dosage forms suitable for pediatric patients at your facility?	51(98.1)	0(0.0)	1(1.9)
Do you have access to pediatric-tailored drug information sources at your facility?	41(78.9)	5(9.6)	6(11.5)

**Table 5:** Hospital pharmacists' responses on how to educate a caregiver to measure 1.5ml amoxicillin /clavulanic acid to a pediatric patient when the measuring cup is only calibrated in 2.5ml and 5ml.

Response	Frequency (%)
Provide an oral syringe with lower volume calibration	38 (73.1)
Provide an oral syringe with lower volume calibration <b>plus</b> send the caregiver back to the physician to adjust the dose	2 (3.85)
Provide an oral syringe with lower volume calibration <b>plus</b> ask the caregiver to figure out the right measurement	4 (7.7)
Provide an oral syringe with lower volume calibration <b>plus</b> send the caregiver back to the physician to adjust the dose <b>plus</b> ask the caregiver to figure out the right measurement	2 (3.85)
No response / Not sure what to do	6 (11.5)

**Table 6:** Hospital pharmacists' responses on how to ensure a 10-month-old infant gets maximum benefit from consulting with a doctor who prescribed Vitamin A 10,000IU when the only preparation available in the pharmacy is a soft-gel capsule.

Response	Frequency (%)
Dispense the soft-gel capsule and ask the caregiver to squeeze the contents into the child's mouth	25 (48.1)
Refer the caregiver back to the Physician Plus dispense and ask the caregiver to squeeze the contents into the child's mouth	4(7.7)
Encourage the caregiver to purchase the liquid preparation outside the facility	5(9.6)
Refer the caregiver back to the physician	3(5.8)
Encourage the caregiver to purchase the liquid preparation outside the facility <b>plus</b> dispense and ask the caregiver to squeeze the contents into the child's mouth	3(5.8)
Encourage the caregiver to purchase liquid preparation outside the facility <b>plus</b> refer back to the physician	1(1.9)
Encourage the caregiver to purchase liquid preparation outside the facility <b>plus</b> refer back to the physician plus dispense and ask the caregiver to squeeze contents into the child's mouth	1(1.9)
No response	10(19.2)

**Table 7:** Frequency of Responses on dosage calculation for a child of 13.2kg body weight prescribed with 2mg/kg of “Pedin” available in 15mg/ml.

Response	Frequency
Correct	24 (46.2)
Incorrect	3(5.8)
No response	25(48.1)

## DISCUSSION

This study determined the knowledge and practice of pediatric pharmacy among hospital pharmacists in Delta State. Although almost all the pharmacists were involved in dispensing of pediatric prescriptions in their facilities, only a few of the pharmacists surveyed had participated in a specialized course in pediatric pharmacy and this may have been done through self-development as reported in a previous study where majority of the pharmacists surveyed had engaged in self-study courses to learn about drug doses for children [11]. It was however quite inspiring that most of the respondents had pediatric pharmacy units in their facilities which will facilitate the provision of care to pediatric patients.

Overall knowledge of the respondents was poor when compared with knowledge scoring in a previous study [13]. This is unimpressive as the high morbidity rate of children in Nigeria portends a need for improved pediatric pharmaceutical care. This overall knowledge performance was somewhat similar to that obtained from previous studies [10,11] where poor knowledge on pediatric doses and pediatric pharmaceutical care were reported among pharmacists and final year pharmacy students respectively. This could have resulted from the inadequate inclusion of pediatric content in the undergraduate pharmacy curriculum [6] as pharmacists do not require more than an undergraduate degree to practice in hospitals in Delta State and this is evident in this study as over two-thirds of pharmacist surveyed had only an undergraduate pharmacy degree.

Poor performances on pharmacokinetics items such as oral and percutaneous absorption in children buttresses

the findings that such courses are not sufficiently included in the pharmacy curricula [5,6,10]. Body weight which was chosen by majority of the respondents as the most accurate method of dosage calculation was also reported as a major basis for pediatric dosage calculation in Palestine [11] this could have resulted from its ease of application in practice.

The common knowledge that medication error could cause more harm in children than adults may influence their taking some measures to mitigate such as these are actually more common in the pediatric population [14, 15].

Impressively, the majority of the respondents could tell what unlicensed drugs and off-label prescriptions were which was also similar to the responses obtained in a previous study among students in the final year of an undergraduate pharmacy school [6].

In their practice of pediatric pharmacy, the respondents did stock suitable dosage forms for pediatric patients this contradicts the findings in an Indian tertiary healthcare facility where dosage formulations for children were majorly unavailable [16]. Also, the high engagement in extemporaneous preparation dispensing for pediatric patients by the respondents corroborate the findings of a previous study that pharmacists will always be required to engage in extemporaneous preparation for children as some medicines will not always be available in a suitable dosage form [ 17]. Availability of pediatric-tailored drug information was not a challenge to the majority of the respondents plausibly as result of easy access to these through the internet, the majority of pediatrician surveyed had also reported access to drug information sources in pediatric prescribing [18],

conversely pharmacy students in the final year had poor knowledge of pediatric-tailored information sources [6].

Provision of oral syringe to ensure accurate dosing and the need to administer the contents of a soft-gel vitamin D capsule when the liquid formulation is not available is in consonance with the finding that discussing administration and demonstrating measurement were major pharmaceutical care approaches reported by pediatric specialty pharmacists[19].

Unexpectedly, less than half of the respondents could accurately calculate the needed drug dose for a pediatric patient, Alqudah and colleagues had previously suggested that there is need for pharmacists to be adept at dosage calculations [7], which is a very important in preventing wrong dosing in this population.

This study, to the best of our knowledge, is the only published study on the knowledge and practice of pediatric pharmacy among hospital pharmacists in Nigeria. Although the sample size was small, it gives an insight into the matter of interest in this study population. Also, paucity of similar studies in Nigeria made comparisons not possible.

**Conclusion.** The overall knowledge of hospital pharmacists in Delta State on pediatric pharmacy was below average, practice of pediatric pharmacy was nonetheless impressive. The majority of the pharmacists in the hospital will benefit from specialized training in pediatric pharmacy practice which will improve healthcare outcomes in this age group.

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