

Nursing Informatics Preparedness of Graduate Nurses in Calabar, Nigeria

¹Akpabio, I. I., ²Ella, R. E

Department of Nursing Science, Faculty of Allied Medical Sciences

College of Medical Sciences, University of Calabar, Cross River State, Nigeria

¹idongawa@yahoo.com, ²retila07@yahoo.com

Abstract: *Nursing informatics (NI) integrates nursing science, computer science and information technology to manage and communicate data as well as information and knowledge in nursing practice, administration and education. In recent years, the need to utilize this specialty area in promoting nursing education has increased tremendously and is also demanded by Nursing Councils. However, a close study of the situation in several nursing education and clinical settings including the study area does not seem to convey a good level of implementation. This study investigated NI preparedness of graduate nurses in Calabar, Nigeria. Specific objectives were to determine their level of knowledge concerning NI; roles to play and their self-reported skills in information technology. Four null hypotheses which guided the study were that their level of awareness of NI, level of awareness of roles related to NI, level of self-reported skills for NI and level of awareness on ways to transit to NI were not significantly related to their service areas. A-38 item validated questionnaire with content validity index of .79 and a reliability coefficient of $r=.73$ was used to gather data from a convenience sample of 102 respondents from a target population of 165 graduate nurses. A total of 101 (99%) questionnaires were adequately completed and used for data analysis. From the results, nurse administrators were 3 (3%); 58 (57%) were clinicians while 40 (40%) were educators. For these sub-groups, average scores on knowledge of NI were 56% each for administrators and clinicians, and 51% for educators; with negative and no significant relationship to their service areas ($r=-0.027; P<0.05$). Furthermore, 25 (25%) of the respondents rated themselves as adequately computer literate while 76 (75%) admitted only a fair knowledge. The computer literacy level of majority of the nurses is inadequate. Informatics education should be emphasized for all levels of nursing education.*

Keywords: *Clinicians, Educators, Graduates, Informatics, Nurses, Nursing, Roles, Skills.*

1. INTRODUCTION

Although nursing informatics (NI) is an essential part of healthcare system, its pace of progress is slow in the developing nations including Nigeria. In the more developed nations, information and communication technology (ICT) are being used in healthcare management system including nursing education. Rapid advancement in ICT in those places has provided solutions to the problems in healthcare management system. These include a wide spectrum of issues such as patient safety, document management and medical education [1]. Nursing informatics is defined as a specialty that integrates nursing science, computer science and information science to manage and communicate data as well as information and knowledge in nursing practice [2]. Nursing informatics facilitates the integration of data, information and knowledge to support nurses and other healthcare providers in their decision-making in all roles and settings. This support is accomplished through the use of information structures, information processes and information technology [2]. The potential for nursing informatics to enhance nursing education and practice, study clinical problem-solving and ultimately improve the quality of care has been a long standing expectation [3]. However, unlike many other information intensive industries, healthcare has been slow in adopting information technology. Nurses, like other healthcare professionals are yet to develop a culture to promote acceptance and use of information technologies as basic tools for information management and exchange [4]. Thus across the globe, nursing leaders and educators have recognized the need for all nurses to participate in nursing informatics. Nurses need to develop the know-how to use information and communication technologies in collection of data, use of information and generation of

knowledge to support nursing practice. Nurses in all domains of practice and at all levels should be technology literate to be able to participate effectively in nursing education, decision making and evaluating of system that should support them in information management, knowledge development and evaluation of new ways of practicing. Furthermore, evidence-based practice in all practice domains requires competencies in informatics.

Commenting on nursing informatics roles, literature holds that the job responsibilities can be varied and encompass project management, health information system management, writing request for proposals or returns on investments; developing educational programmes, evaluating work process flows, writing policies, aiding in the design and content of an organizations' intranet, and making recommendations to the nurse leaders on a preferred practice or educational system for nursing [2].

Similarly, on the top three competencies that nurse informatics practitioners should posses, it is asserted that their roles vary among organizations depending on the organization's needs. In general however, she identified three beneficial competencies to include change management, work flow documentation and requirements' gathering [5].

Furthermore, the emphasis is that nurses need to embrace new technology to meet future demands on healthcare and the skills identified as needed for such demands include information sharing and security; governance of content, and supporting others to navigate information sources [6].

Nursing informatics' awareness and skills needed by an informatics nurse and identified in literature include clinical experience and competence, critical thinking, analysis and problem-solving, technical computer skills, business correspondence skills, interpersonal skills, and research and project management skills [7]. The argument is that being successful in the field of nursing informatics takes a combination of adequate awareness, skills or competencies many of which some practitioners already have, and many that they will still need to develop. However, it is unfortunate to note that in developing competency in baccalaureate nursing education and preparing nurses to enter today's practice environment, the baccalaureate nursing education is not preparing graduates with adequate competencies to practice in today's technology-rich health care environment [8]. In this regards competencies in nursing informatics is lacking in students and faculty at local, national and international levels. Additionally, the argument is that faculty may be the biggest hindrance to this issue. Similarly it is assumed that many nurse educators do not understand the scope of NI or know what it entails and they may be the biggest barrier to developing students' competencies in NI [9]. The Authors emphasized that nurse educators must move beyond thinking that NI is simply using computers in nursing or posting a course outline.

Informatics awareness and competencies are needed by all nurses whether or not they specialize in informatics. As nurse settings become more ubiquitous, computing environments, all nurses should be both information and computer literate. The graduate nurses are saddled with the responsibility of teaching others; some are in the leadership positions at the administration and clinical sectors. The need for graduate nurses to possess capacity for NI is glaringly obvious. For the graduate nurse educators, one of the greatest responsibilities in any knowledge-based profession is passing that knowledge to a new generation of practitioners. The next generation of nurse educators will need a solid grounding in nursing informatics to teach new nurses the computer skills they will need in the work place. This will also be crucial for more experienced educators especially those who came late to computer use and must expend extra time and effort on the necessary professional updates and continuing education. The questions therefore are whether they have adequate awareness concerning nursing informatics, roles to perform in the area of nursing informatics, skills needed for nursing informatics and ways to transit to nursing informatics. Furthermore, it was necessary to examine if their level of awareness of NI, the roles concerning NI, their self-report skills and awareness of ways to transit to NI were significantly related to their service areas. These therefore provided the impetus for the study to identify informatics education needs of graduate nurses with focus on the following objectives:

- To determine the respondents' computer literacy level;
- To examine graduate nurses level of knowledge concerning nursing informatics;

- Determine their awareness of roles to perform in nursing informatics;
- Ascertain their awareness of skills needed for NI;
- Determine their awareness of ways to transit to nursing informatics;

Hypotheses:

Four null hypotheses were generated to further guide the study as follows:

HO₁: Nurses level of awareness of NI is not significantly related to their service area.

HO₂: Nurses level of awareness of roles of NI is not significantly related to their areas.

HO₃: Nurses level of self-reported skills for NI is not significantly related to their service areas.

HO₄: Nurses level of awareness on ways to transit to NI is not significantly related to their service areas.

2. MATERIALS AND METHODS

This study was a cross-sectional and descriptive design and participants were registered nurses with degree in any field provided they were working as nurse educators, clinicians or nurse administrators. The target population of graduate nurses in Calabar, Nigeria was 165 and out of this number, 102 respondents were selected through convenience sampling technique.

2.1. Instrument for Data Collection

Collection of data was with a 38-item validated questionnaire developed by the researchers with content validity index of .79 and a reliability coefficient of $r=.73$. The questionnaire had five sections. section A of the questionnaire was to provide data on the participants' socio-demographic data, section B provided data on respondents' level of awareness concerning nursing informatics, section C was on awareness of roles to perform as they relate to nursing informatics, section D was to generate data concerning skills needed for nursing informatics while section E was to provide data on awareness of ways to transit to nursing informatics. They were to complete the questionnaire by choosing from the options, which ranged from strongly agree, agree, strongly disagree to disagree or to fill their answers on spaces provided.

2.2. Ethical Consideration

Written permission was obtained from the Ethical Committees of the Hospitals, the principals and the head of the institutions while verbal informed consent was also obtained from the participants. Anonymity was ensured through non-inclusion of names in any section of the questionnaire.

2.3. Procedure For Data Collection

The researchers administrated the questionnaire directly to the respondents through face-to-face interaction and on the spot retrieval of completed questionnaire so as to obtain a good response rate and ensure that the answers reflected the participants' level of awareness and self-reported skills.

2.4. Data Analysis

From 102 questionnaires administered 101 (99.1%) were sufficiently completed and used for data analysis using Statistical Package for Social Science (SPSS) version 17. Descriptive data involved frequency and percentages while the four null hypotheses were tested using Spearman rho Correlation Coefficient Statistics determined at level of significance 0.05.

3. RESULTS

3.1. Descriptive Data Results

3.1.1. Socio-Demographic Characteristics

The result of the socio-demographic variables of respondents is presented in Table 1.

The result of the socio-demographic characteristics of respondents as presented in Table 1 shows that the nurse administrators were 3 (3%), nurse clinicians were 58 (57%) while 40 (40%) were nurse educators.

Table1. Socio-demographic data of respondents (*n*=101)

Variable		Frequency	Percentage
Gender:	Male	4	4
	Female	97	97
Total		101	101
Age in years:	28-39	23	23
	40-49	50	50
	50-60	26	26
	61	2	2
Total		101	100%
Professional rank:	Asst. Deputy Director	7	7
	Asst. chief nurse educator	19	19
	Chief Nursing officers/tutors	27	27
	Lecturers 1&11	4	4
	Principal Nursing officers/tutors	18	8
	Nursing officers 1 & 11	8	18
	Acting provost	1	1
	Senior lecturers	2	2
	Senior nursing officers	12	12
	Clinical instructors	3	3
Total		101	100%
Qualifications:	RN/RM/Ph.D	14	14
	PGDE	2	2
	B.Sc./B.N.Sc.	85	84
Total		101	100%
Service areas:	Nurse clinicians	58	57
	Nurse administrators	3	3
	Nurse educators	40	40
Total		101	100

3.1.2. Computer Literacy Level of Respondents

The computer literacy level of the respondents is presented in Table 2.

Table2. Computer literacy level of respondents

Variable	Frequency	Percentage
Excellent	Nil	-
Adequate	25	25
Fair	76	75
Poor/Non-computer literate	Nil	-
Total	101	100

Regarding the computer literacy level of the respondents, the result is presented in Table 2. The results in Table 2 shows that while majority 76 (75%) of the respondents rated themselves as fairly computer literate, only 25 (25%) rated themselves as being adequately computer literate.

3.1.3. The Respondents Level of Knowledge of Nursing Informatics

The respondents' level of knowledge of nursing informatics is presented in Table 3

Table3. Graduate Nurses' level of knowledge of NI (*n*=101)

Level of awareness	SA	A	SD	D	Total
NI is an exclusive aspect of computer Science	40 (40%)	22 (22%)	24 (24%)	15 (15%)	101 (100%)
NI is a combination of computer and Information science	12 (12%)	18 (18%)	52 (52%)	19 (19%)	101(100%)
NI is a combination of nursing science, computer science and information technology	30 (30%)	22 (22%)	30 (30%)	19 (19%)	101(100%)
NI is designed to assist in management and processing of nursing data and information only.	13 (13%)	12 (12%)	35 (35%)	41(41%)	101(100%)
The goal of NI is to support decision-making only in specialized roles	53 (53%)	36 (36%)	8 (8%)	4 (4%)	101 (100%)

The results show that wrong responses were given by 53 (53%) of the respondents who strongly agreed and 36 (36%) who also agreed to the statement that the goal of NI is to support decision-

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making only in specialized roles. Similar wrong responses were given by 12 (12%) of the respondents who strongly agreed and 18 (18%) who agreed that NI is a combination of computers and information science only. On the other hand, correct responses were given by 30 (30%) of the respondents who strongly agreed and 22 (22%) who agreed that NI is a combination of nursing science, computer science and information technology.

3.1.4. The Respondents' Level of Awareness of Nursing Informatics Roles

The respondents' level of awareness of Nursing Informatics roles is presented in Table 4

The results show that 69 (68%) of the respondents strongly agreed and 28 (28%) agreed correctly that NI roles support the need for all nurses to become computer literate. However, the correct responses were only provided by 10 (10%) who strongly agreed and 23 who agreed that NI roles include nurses in the clinical sectors.

Table4. Level of awareness of NI role (n=101)

Awareness of NI roles	SA	A	SD	D	Total
Informatics nurses play a vital role in the implementation of clinical applications including clinical and nursing documentation.	65 (64%)	28 (28%)	5 (5%)	3 (3%)	101 (100%)
Nurse informatics process data to information to bring about new knowledge	2 (2%)	4 (4%)	53 (53%)	42 (42%)	101 (100%)
NI roles support the need for all nurses to become computer literate.	69 (68%)	28 (28%)	3 (3%)	1 (1%)	101 (100%)
NI roles are required in the area of nursing research to guide decision making.	30 (30%)	24 (24%)	15 (15%)	32 (32%)	101 (100%)
NI roles include chief nursing officers.	10 (10%)	37 (37%)	22 (22%)	32 (32%)	101 (100%)
Becoming educated in NI is for the most part, a self-directed and independent endeavour.	10 (10%)	23 (23%)	30 (30%)	38 (38%)	101 (100%)

3.1.5. Awareness of Skills Needed for NI

Awareness of skills needed for Nursing Informatics is presented in Table 5

Table5. Level of awareness of skills needed for NI (n=101)

Awareness of skills	SA	A	SD	D	Total
Clinical experience and competence	45 (45%)	32 (32%)	13 (13%)	11 (11%)	101 (100%)
Critical thinking and analysis	52 (52%)	13 (13%)	16 (16%)	20 (20%)	101 (100%)
Problem-solving.	36 (36%)	60 (59%)	3 (3%)	2 (2%)	101 (100%)
Computer and information technology.	36 (36%)	60 (59%)	4 (4%)	1 (1%)	101 (100%)
Business and job correspondence skill.	5 (5%)	3 (3%)	32 (32%)	61 (60%)	101 (100%)
Inter-personal skill	16 (16%)	30 (30%)	15 (15%)	40 (40%)	101 (100%)
Project management skill.	24 (24%)	11 (11%)	42 (42%)	24 (24%)	101 (100%)

The results on awareness of skills needed for NI as presented in Table 5 show that 36 (36%) of the respondents strongly agreed and 60 (60%) agreed and were therefore aware of the skills as they relate to computer and information technology. Regarding problem-solving, 36 (36%) strongly accepted it as one of the skills needed in NI as well as 60 (60%) who also agreed. On the other hand, correct responses were provided only by 5 (5%) of the respondents who strongly agreed and 3 (3%) who agreed that the skills included job correspondence skills.

3.1.6. Awareness of Ways to Transit to Nursing Informatics

Awareness of ways to transit to Nursing Informatics is presented in Table 6.

Table6. Awareness of ways to transit to NI (n=101).

Awareness	SA	A	D	SD	Total
Need to learn more about NI.	101(100)	-	-	-	101 (100%)
Volunteer for an informatics related role	21 (21%)	30(30%)	15(15%)	35 (35%)	101 (100%)
Join professional organization.	23 (23%)	10 (10%)	28 (28%)	30(30%)	101(100%)
Lectures, conferences, seminar, workshop	26 (26%)	50 (50%)	15 (15%)	10(10%)	101(100%)
Interview nurses in the needed roles	18 (18%)	9 (9%)	24 (24%)	50(50%)	101(100%)
Attend a certification	15 (15%)	15 (15%)	51 (51%)	20(20%)	101(100%)
Pursue a related graduate degree.	18 (18%)	9 (9%)	25 (25%)	43 (43%)	101(100%)
Network inside and outside organization	23 (23%)	47 (47%)	22 (22%)	19 (19%)	101(100%)
Volunteer for different projects in individual organization	19 (19%)	10 (10%)	12 (12%)	60 (59%)	101(100%)
Learn a computer programming language or a system analysis	33 (33%)	40 (40%)	22 (22%)	6 (6%)	101(100%)
Find NI mentor	51 (51%)	20 (20%)	15(15%)	15 (15%)	101(100%)
Develop project management skills.	13 (13%)	20 (20%)	18 (18%)	50 (50%)	101 (100%)

Awareness of ways to transit to NI is presented in Table 6. All the respondents, 101 (100%) correctly identified learning more about NI as a way of transiting to it and on the other hand, only 18 (18%) of the respondents strongly agreed that interviewing nurses in the role they expect to perform is a way of transiting into NI.

3.2. The Results of the Study Hypotheses

HO₁: Nurses level of awareness of NI is not significantly related to their service area.

The result is presented in Table 7.

Table7. Relationship between Graduate Nurses' level of awareness of NI and their service areas.

			Service area.	Level of Awareness of NI
Spearman's rho	Service area	Correlation coefficient Sig.(1-tailed)	1.000	-.027
	Level of awareness of NI	N Correlation coefficient Sig.(1-tailed)	.90 -.027	.402 1.000
		N	.402	90
				101

The result presented in Table 7 shows that the correlation coefficient ($r = -0.027$) is negative. This implies that the level of awareness of NI is not significantly related to their services areas. The null hypothesis is not therefore rejected.

HO₂: Nurses level of awareness of roles for NI is not significantly related to their service areas.

The result is presented in Table 8.

Table8. Relationship between nurses' level of awareness of roles for NI and their Service areas

			Service area	Awareness of role for NI
Spearman's rho	Service area	Correlation coefficient Sig.(2-tailed)	1.000	.394(**)
	Level of awareness of role for NI	N. Correlation coefficient Sig. (2-tailed)	.90 .394(**)	.000 1.000
		N	.000	90
				101

Correlation is significant at the .05 level (2-tailed)

The result presented in Table 8 shows that the Correlation Coefficient (0.394) is positive. This implies that the level of awareness of NI roles is significantly related to respondents' service areas. The null hypothesis is therefore rejected.

HO₃: Relationship between awareness of skills needed for NI and respondents' service areas

The relationship between awareness of skills needed for NI and respondents' service areas is presented in Table 9.

The result shows that correlation coefficient (.355) is positive. This implies that the level of awareness of skills needed for NI is significantly related to respondents' services areas. The null hypothesis of no significant relationship is therefore rejected.

Table9. Relationship between respondents' awareness of skills needed for NI and their service areas.

			Service area	Awareness skills
Spearman's rho	Service area	Correlation coefficient Sig.(2-tailed)	1.00	.355(**)
	Awareness of skills needed for NI	N Correlation coefficient Sig.(2-tailed)	.90 .355(**)	.001 1.000
		N	.001	90
				101

Correlation is significant at .05 levels (2-tailed)

HO4: Relationship between respondents' awareness of ways to transit to NI and service areas.

The relationship between respondents' awareness of ways to transit to NI and service areas is presented in Table 10.

Table10. Relationship between respondents' level of awareness of ways to transit to NI and service areas

			Service areas	Awareness of ways to transit to NI.
Spearman's rho	Service area.	Correlation coefficient Sig.(2-tailed) N	1.000 90	.346(**) .001 101
	Awareness of ways to transit to NI.	Correlation coefficient Sig.(2-tailed) N	.346(**) .001 90	1.000 101

Correlation coefficient is significant at the .01 level (2-tailed)

The result shows that the correlation coefficient (.346) is positive. This implies that the level of awareness of ways to transit to NI is significantly related to service areas of respondents'. The null hypothesis of no significant relationship is therefore rejected.

4. DISCUSSION

The aim of this study was to investigate nursing informatics preparedness of graduate nurses in Calabar, Nigeria with specific focus on identifying their computer literacy level, their level of knowledge of NI, awareness of roles, skills and ways to transit to NI. The results show that while the levels of knowledge were high in some areas, the percentage scores were low in some other vital areas that tested their level of knowledge of NI. Many of the graduate nurses do not know the components of NI. For instance majority of the respondents' 70% erroneously asserted that NI is a combination of computer, and information science only. The result shows that much of their knowledge of NI is focused only on simply using of computers.

However, it is generally known that for NI to be complete, it should cover Nursing science, computer science and information science [10]. This low level of knowledge as it relates to NI by the respondents in this study is similar to the findings of a study, which showed that many nurse educators in their study did not understand the scope of NI [9]. Since NI when complete with all its components facilitates the integration of data, information and knowledge to support nurses and other healthcare providers in their decision-making in all roles and settings, graduate nurses who are potential nurse educators and mentors should move beyond thinking that NI is simply using computers. Working in environments of increasingly complex clinical care and contending with the management of large volumes of information, nurses need to avail themselves of the technological tools that can support quality practice that is optimally safe, informed and knowledge-based.

The result of this study also shows that only 24.8% of the graduate nurses rated themselves as adequately computer literate. This finding confirms the assertion that many nurses are yet to develop a culture to promote acceptances and use of information technology as basic tools for information management and exchange [3]. To be computer literate requires skill and knowledge in computer science [11]. As already stated, computer literacy is said to include the skills to be computer fluent, not only being able to manage a computer and use common software applications (e.g. e-mail, word processing, spreadsheets and data based), but also to know about computer and information systems, how they work and how they impact society [8].

Further findings from this study similarly show that many of the respondents do not have adequate awareness of roles, skills and ways to transit to NI. These findings are not surprising because when knowledge of NI is low, there is likelihood that the respondents will also not know or be aware of needed roles, skills and ways to transit to NI. These findings corroborates with several literature supporting the use of NI in nursing education and practice. Skills and knowledge of NI, roles needed and ways to transit to NI are required for nurses to progress and function in today's educational and healthcare settings and to also develop or transmit these knowledge and skills in students. Literature abounds on the benefits of such progress [8].

It is important to note that patients can be empowered when nurses employ their NI skills and knowledge [12], there could be increase in accessibility of care [13] safety [14] and quality of care

[15]. NI skills can also advance the nursing discipline [16] and assist nurses in providing evidence-based care, promote a spirit of inquiry, critical thinking and a philosophy of life-long learning [17]. Finally, the healthcare system can benefit by using technology to reduce costs and increase efficiencies [18] and to help manage all the information [19].

From the hypothesis the result shows that there was no significant relationship between their level of knowledge of NI and their service areas. This means that the level of knowledge of the three categories of graduate nurses (nurse administrators, clinicians and educators) were not significantly different. These findings may imply that their knowledge of NI as already discussed may only be at the basic level of computer operation, it was not also surprising to observe that the respondents' awareness of roles, skills and ways to transit to nursing informatics were all significantly related to their service areas. Informatics awareness and competencies are needed by all nurses whether or not they specialize in informatics and irrespective of their area of specialty especially when they need the knowledge for their roles performance. This argument stands strong since NI skills and role performance are expected to increase performance and efficiencies in each area of practice [18].

Furthermore, every nurse should have the capacity to use available technology to contribute to the advancement of role performance in her given area of specialty.

5. CONCLUSION

Graduate nurses' level of knowledge of NI is just fair and knowledge possessed is mostly limited to simply using computer. Majority of the graduate nurses do not know the scope or the components of NI and for majority of them also their computer literacy level is only fair. Awareness of NI roles, skills, and ways to transit to nursing informatics is similarly limited to basic computer skills but limited on management of information and other NI roles.

Furthermore, the respondent's level of knowledge of NI was not significantly related to their service areas but their level of awareness of roles, skills, and ways to transit to NI were all related to their service areas.

1.2. Implication of the Findings

Majority of the graduate nurses are yet to embrace the notion of informatics and know its components so that they can best use it to impact on the services they render. There are opportunities or gaps to fill to enhance the training of graduate nurses in NI and advance the design and application of NI to deliver services that are informed by the most current evidence.

1.3. Recommendations

- Graduate nurses need to be obligated and supported in the attainment of informatics knowledge and competencies
- A formal list of NI competencies needed for effective performance should be provided. This should establish and document minimal competencies as NI priorities. This is necessary since it may not be easy to acquire all the knowledge and competencies overnight.
- There is need to incorporate accreditation criteria that necessitate an integration of informatics core knowledge and skills (competencies) in all nursing programmes.
- It is necessary to seek and allocate funding for the development of needed material and equipments to support and enhance knowledge and skills acquisition.
- There should be in place the provision of human resources to support the acquisition of informatics competencies.

1.3.1. Further Studies

Further studies should be conducted to identify:

- The areas of priority for the advancement of informatics in nursing.
- The possibilities to accelerate the uptake of NI

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AUTHORS' BIOGRAPHY



Idongesit I. Akpabio is a Nigerian Registered Nurse/Registered Midwife with B.Sc. Nursing; MPA; M.Sc. and Ph.D. Her area of specialization is Community Health Nursing. She currently works as an Associate Professor with University of Calabar, Nigeria and has special skills for health promotion, disease prevention and healthcare research which earned her several awards



Regina Ella is a Nigerian Registered Nurse/Midwife with B.Sc. Nursing; M.Ed.; and Ph.D. with specialization in Educational Administration and planning. She currently works as a senior lecturer with University of Calabar. She is a consultant trainer and HIV/AIDS' palliative care advisor with CEDPA. Her areas of interest include Nursing education and HIV/AIDS.