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Original Research Article

Nursing Students Awareness and Willingness toward Genomic Nursing Practice

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Abstract: Genomic nursing refers to the practice of nursing that incorporates genomic information to deliver precision healthcare. It includes assessing, intervening, evaluating, protecting, promoting, advocating, educating and conducting research to safeguard the health, safety, and welfare of individuals and society. The aim of the study was to assess knowledge and readiness towards practice of genomic nursing among undergraduate nursing students in Federal University Birnin Kebbi. And to find out statistically significant relationship between their level of knowledge of genomic nursing and their selected socio-demographic variables. Cross-sectional descriptive design was employed for the study. Stratified random sampling was used to select 180 nursing students (100-500 level). The findings reviewed that 47.2% respondents had average knowledge and 62.7% were not ready to practice genomic nursing. And there was statistically significant association between their level of knowledge of genomic concepts and their selected socio-demographic variables such as respondents' age ($\chi^2 = 23.892^a$, $p = 0.000$, df = 4) and respondents' level of study ($\chi^2 = 65.326^a$, p = 0.000, df = 8). In conclusion, the results revealed that majority of the respondents have average knowledge and not ready to practice genomic nursing. And there was statistically significant association between their level of knowledge of genomic concepts and their selected socio-demographic variables such as respondents' age and level of study.

Keywords: Knowledge, Readiness, Practice, Genomic Nursing, Nursing Students.

INTRODUCTION

Genomic nursing refers to the practice of nursing that incorporates genomic information to deliver precision healthcare. It includes assessing, intervening, evaluating, protecting, promoting, advocating, educating, and conducting research to safeguard the health, safety, and welfare of individuals and society. Therefore, genomics nursing focuses on the health and interconnectedness of individuals, families, communities, and populations in relation to both hereditary and nonhereditary genomic conditions. Genomic conditions encompass both hereditary and non-hereditary changes in human health, which may include anomalies, behaviors, diseases, challenges, or tendencies linked to genetic, genomic, or other omic factors. Consequently, genomics nurses focus on how disorders related to single genes, chromosomal abnormalities, variations in gene copy numbers, interactions between genes, interactions between genes and the environment (including those with social determinants of health [SDOH]), epigenomics, gene expression, and molecular modifications can influence gene expression or otherwise impact human health.

Genomic nursing is an emerging specialty focused on integrating genetic and genomic information into everyday nursing practice to support individualized and precision healthcare. As genomic testing becomes increasingly integrated into clinical care, nurses are often the first professionals to identify patients who may benefit from genetic assessment, explain testing processes, and support decision-making throughout the genomic care pathway (Coulson, 2022).

At the core of genomic nursing lies the necessity for a solid competency framework: in 2023, the United Kingdom introduced an updated Genomic Competency Framework for all registered nurses, detailing eight essential competencies such as

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recognizing individuals who may benefit from genomic services, customizing communication, and offering continuous support. These competencies highlight the vital role nurses play—not only in carrying out care plans but also in promoting informed decision-making and ensuring the ethical application of genomic information (Genomics Education Programme, 2023).

Nurse educators are crucial in creating the genomic nursing workforce. A framework released in 2025 outlined three main areas and seven competency areas for Genomics Nurse Educators. It highlighted the importance of strong genomic knowledge, teaching skills, and leadership to integrate genomics into nursing education worldwide. These educators serve as agents of change. They simplify complex genomic science and develop practical curricula. This helps prepare future nurses to confidently use genomics in their work (Himes *et al.,* 2025).

Despite the rising importance of genomics, many nurses still lack confidence and feel unprepared to use genomic data in clinical settings. This gap has led to demands for more genomic education for both pre-licensure and advanced practice nurses. By improving genomic knowledge and skills, nurses can become vital members of multidisciplinary teams that provide precision medicine. This enhances patient assessments, customizes interventions, and leads to safer, more effective care (American Association of Nurse Practitioners, 2023).

Scopes of Genomic Nursing

Genomic nursing includes a wide range of practices that bring genetic and genomic knowledge into every part of patient care, assessment, and decision-making. The basic scope involves using genomic information in regular nursing assessments. This includes gathering detailed family histories, assessing inherited risk factors, and identifying when a patient might benefit from genetic testing or counseling (American Nurses Association & International Society of Nurses in Genetics, 2025).

A major focus of genomic nursing is patient and family education. Nurses play a central role in explaining genetic concepts, test implications, inheritance patterns, and lifestyle or monitoring recommendations based on genomic findings. This is becoming more important as precision health grows. Patients encounter more complex genetic information that needs to be interpreted in clear and culturally sensitive ways. Through education, genomic nurses improve patient empowerment and encourage informed decision-making about testing and treatment (Coulson, 2022). Another key focus is the coordination and facilitation of genetic and genomic testing. Nurses help identify suitable tests, obtain informed consent, ensure proper sample handling, and support patients before, during, and after the testing process. They also serve as links between laboratories, genetic specialists, and other healthcare providers to ensure that genomic information is communicated and used correctly in clinical decision-making (Limoges *et al.,* 2022).

Interpreting genomic information in patient care is also an important part of nursing. Nurses may not interpret diagnoses the same way geneticists do, but they must understand genomic results well enough to include them in nursing care plans, assess how treatments may be affected, and recognize when a referral to a specialist is necessary. This involvement includes areas like pharmacogenomics, where nurses monitor patient reactions and adjust care based on how genes interact with drugs (Kabbani *et al.,* 2023). Genomic nursing also includes advocacy and ethical responsibility, especially around patient privacy, nondiscrimination, and fair access to genomic services. Nurses make sure sensitive genomic data is handled ethically and advocate for individuals from underserved or underrepresented communities. These groups may face greater risks from genomic disparities. This supports worldwide efforts to ensure that advances in genomics do not increase health inequalities but rather help create more inclusive and ethical healthcare systems (Nature Medicine Editorial, 2023). Genomic nursing includes research, leadership, and education. Nurses take part in genomic research, help create evidence-based guidelines, and contribute to developing academic and clinical genomic courses. As genomic knowledge becomes vital in healthcare, nursing educators and leaders must ensure that nurses gain the skills necessary to practice safely and effectively in a genomics-enabled environment (Himes *et al.,* 2025).

Challenges and Barriers in Genomic Nursing

Genomic nursing faces ongoing gaps in knowledge and skills among nurses. Many practicing nurses do not fully understand genomic and genetic principles, such as inheritance, pharmacogenomics, and risk assessment. This lack of understanding affects their confidence in using genomics in clinical practice (Chang *et al.,* 2023). A major educational barrier is the limited genomic content in nursing curricula. There is not enough time set aside for genomics in undergraduate programs, few qualified educators to teach genomic topics, and no standardized competency assessments for genomic practice (Global Landscape of Nursing and Genomics, 2021). Beyond education, institutional and structural barriers also hinder genomics integration. There is often confusion about the nursing role in genetic services, which creates uncertainty about responsibilities in genomic care (Latha *et al.,* 2025). Time constraints and workflow issues create additional challenges. Nurses often report that they lack time during busy clinical shifts to conduct genomic risk assessments, gather family trees or detailed histories, or explain and review genetic test results with patients. Financial limitations also contribute to the problem. Another critical barrier is professional confidence and comfort. For example, a study of pediatric oncology nurses found that over 50% felt

unprepared or uncomfortable answering questions about genomics from patients and families. This highlights the psychological barrier to using genomic data in patient care (Hines-Dowell, 2024). Cultural, policy, and systemic issues also impede progress. There is insufficient global leadership and coordination to drive the integration of genomics into nursing: some countries lack national standards, competency frameworks, or policies that encourage or mandate genomic education for nurses (Global Landscape of Nursing and Genomics, 2021).

THEORETICAL REVIEW

The conceptual frame work for the present study is based on general system theory proposed by a Biologist Ludwig Von in 1968. According to him a system is a complex of elements in reaction. He defines the system as a whole by virtue of its independents part. The definition implies the whole of the system is distinguishable from its environment and it has parts, which have their independent function. It also states that function of the interdependent part is responsible for the functioning of whole.

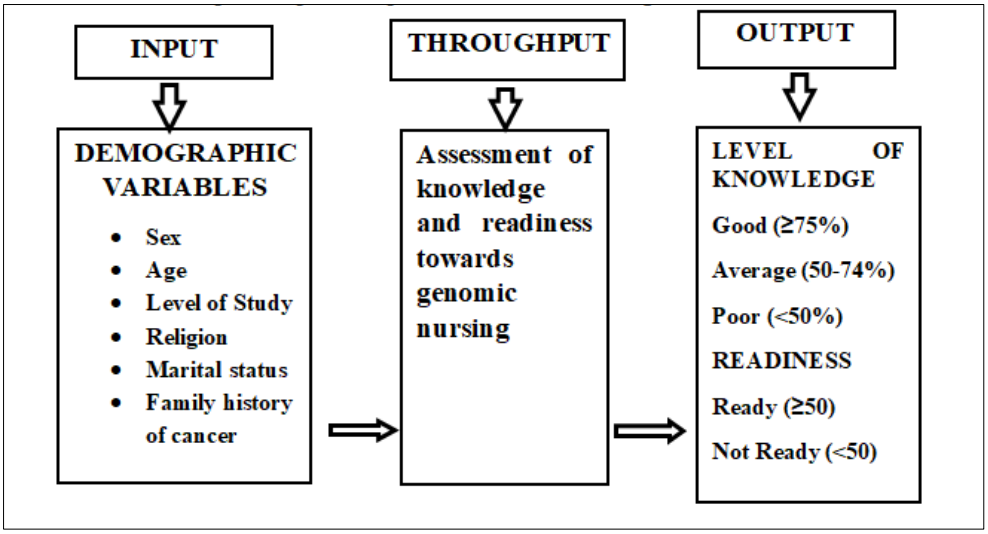

Fig. 1.3: Theoretical Frame Work

This model is comprised of 3 primary components.

- Input
- Through put
- Output
  - **Input** – It refers to the matter, energy and information that enter to the system through its boundary. In the present study the input refers to the target population and their previous knowledge and readiness towards genomic nursing.
  - **Through put**- In the present study the through put refers to process of assessing the existing knowledge and readiness towards genomic nursing.
  - **Output**- In the present study the output refers to the level of knowledge and readiness towards genomic nursing among nursing students in Federal University Birnin Kebbi.

The Biologist Ludwig Von model is best suitable to this study which is undertaken to assess the knowledge and readiness towards genomic nursing among nursing students in Federal University Birnin Kebbi.

OBJECTIVES OF THE STUDY

1. Assess knowledge of genomic nursing among nursing students in selected universities in Northwest Nigeria
2. Identify readiness towards genomic nursing Practice among nursing students in Selected Universities in Northwest Nigeria.
3. Assess statistically significant relationship between their level of knowledge of genomic nursing and their selected socio-demographic variables.

METHODOLOGY

This study utilized cross-sectional descriptive survey design to assess the level of knowledge and readiness towards genomic nursing among nursing students in Federal University Birnin Kebbi with a population of 328 nursing students. Stratified random sampling technique was used to select nursing students studying in Federal University Birnin Kebbi. The instrument for data collection was an adapted Genetic Nursing Concept Inventory (GNCI) questionnaire. Reliability was established after administering the tool to 10 nursing students in a different University with the same characteristics. The reliability was calculated using Spearman's Brown formula (split half reliability method) with reliability value of 0.80. The data was collected using structured Questionnaire to assess the knowledge

and readiness towards genomic nursing. Data was analyzed using descriptive and inferential statistics with the aid of IBM SPSS Statistics for version 20.0

RESULTS OF THE STUDY

Section A: Bio Data of the Respondents

Table 1.1: Respondent Socio-demographic data N=180

Variable	Category	Frequency	Percentage %
Age	16–20 years	85	47.2
	21–25 years	84	46.7
	≥ 26 years	11	6.1
Sex	Male	29	16.1
	Female	151	83.9
Level of Study	100 Level	58	32.2
	200 Level	53	29.4
	300 Level	23	12.8
	400 Level	24	13.3
	500 Level	22	12.2
Religion	Islam	156	86.7
	Christianity	24	13.3
	Others	—	—
Marital Status	Single	164	91.1
	Married	14	7.8
	Divorced	1	0.6
	Widowed	1	0.6
Family History of Cancer	Yes	18	10.0
	No	162	90.0

In Table 1.1, most of the respondents were aged 16–20 years, 85 (47.2%), followed closely by those aged 21–25 years, 84 (46.7%), while only 11 (6.1%) were aged 26 years and above. This shows that the majority of participants were young adults. In terms of sex, a greater proportion of the respondents were female, 151 (83.9%), while males accounted for 29 (16.1%), indicating a predominantly female population. With regard to the level of study, most respondents were in the 100 level, 58 (32.2%), followed by 200 level, 53 (29.4%). Those in 300, 400, and 500 levels were 23 (12.8%), 24 (13.3%), and 22 (12.2%) respectively. This suggests that lower-level students formed the largest group of participants. For religion, the majority of respondents were Muslims, 156 (86.7%), while Christians constituted 24 (13.3%), with no respondents indicating other religious affiliations. The marital status distribution showed that most respondents were single, 164 (91.1%), followed by married individuals, 14 (7.8%). Only 1 respondent (0.6%) was divorced and another 1 (0.6%) widowed. This indicates that the population consisted largely of unmarried young adults. Regarding family history of cancer, 18 (10.0%) of the respondents reported having a family history of cancer, whereas the majority, 162 (90.0%), indicated that they had no such history.

Section B: Knowledge of Genomic Concepts

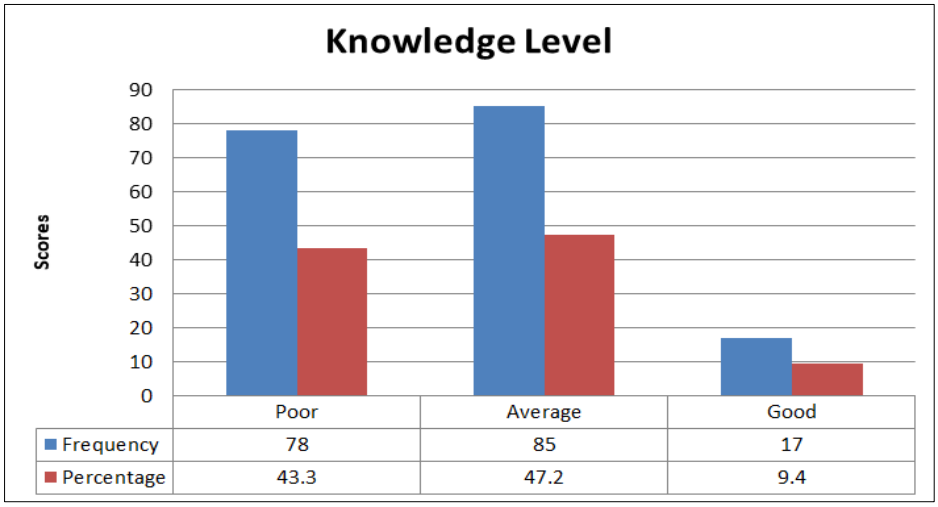

Figure 1.1: Respondents knowledge level of genomic concepts N=180

Figure 1.1 shows that the majority of respondents, 85 (47.2%), had an average level of knowledge of genomic concepts, followed by 78 (43.3%) who demonstrated poor knowledge. Only 17 (9.4%) of the respondents had good knowledge.

Section C: Readiness to Practice Genomic Nursing

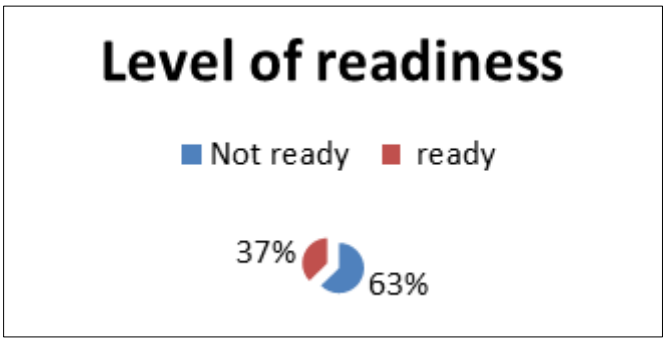

Figure 1.2: Respondents level of readiness to practice genomic nursing N=180s

Figure 1.2 shows that the majority of respondents, 113 (62.7%), were not ready to practice genomics nursing, while 67 (37.3%) indicated that they were ready.

Table 1.2: Statistical significant relationship between level of knowledge of genomic s and selected socio-demographic variables N=180

Variables	Knowledge Level			χ^2	df	p-value
	Poor	Average	Good			
Age	**F (%)**	**F (%)**	**F (%)**			
16–20 years	49 (57.6%)	35 (41.2%)	1 (1.2%)	**23.892[a]**	**4**	**0.000***
21–25 years	23 (27.4%)	47 (56.0%)	14 (16.7%)			
≥ 26 years	6 (54.5%)	3 (27.3%)	2 (18.2%)			
Sex						
Male	14 (48.3%)	11 (37.9%)	4 (13.8%)	**1.519[a]**	**2**	**0.468**
Female	64 (42.4%)	74 (49.0%)	13 (8.6%)			
Level of Study						
100 Level	41 (70.7%)	17 (29.3%)	0 (0.0%)	**65.326[a]**	**8**	**0.000***
200 Level	16 (30.2%)	36 (67.9%)	1 (1.9%)			
300 Level	5 (21.7%)	13 (56.5%)	5 (21.7%)			
400 Level	2 (8.3%)	17 (70.8%)	5 (20.8%)			
500 Level	14 (63.6%)	2 (9.1%)	6 (27.3%)			
Family History of Cancer						
Yes	5 (27.8%)	11 (61.1%)	2 (11.1%)	**1.993[a]**	**2**	**0.369**
No	73 (45.1%)	74 (45.7%)	15 (9.3%)			

The results in Table 1.2 show that there was a statistically significant association between respondents' age and their level of knowledge of genomic concepts, $\chi^2 = 23.892^a$, $p = 0.000$, $df = 4$. Younger respondents aged 16–20 years had the highest proportion of poor knowledge, while those aged 21–25 years showed a relatively higher proportion of good knowledge. Sex did not show a significant association with knowledge level, $\chi^2 = 1.519^a$, $p = 0.468$, $df = 2$. However, there was a statistically significant association between respondents' level of study and their knowledge of genomic concepts, $\chi^2 = 65.326^a$, $p = 0.000$, $df = 8$. Students in the 300 and 400 levels demonstrated notably higher proportions of good knowledge compared to those in the lower levels (100 and 200 levels), who predominantly exhibited poor knowledge. Furthermore, family history of cancer did not show a significant association with respondents' knowledge level, $\chi^2 = 1.993^a$, $p = 0.369$, $df = 2$.

Implication of Findings to Nursing

The findings of this study have important implications for nursing education, nursing practice, and the future of nursing as a profession. The findings show a significant gap in nursing students' knowledge of genomics and their readiness, which affects nursing education and practice directly. As genomics becomes more important in-patient assessment, disease prevention, and personalized care, nurses who lack sufficient knowledge may struggle to provide evidence-based genomics nursing services. This emphasizes the urgent need for nursing programs to strengthen and

include genomic content earlier and more consistently throughout all training levels. The low readiness to practice genomics nursing also suggests that students need more practical exposure, including simulations, case-based learning, and clinical experiences related to genomics. It is also crucial to improve faculty competency in genomics, as educators play a key role in preparing students for modern nursing roles. Overall, enhancing genomic education and practice readiness is essential to equip future nurses with the skills and confidence necessary to engage effectively in the changing field of precision healthcare.

SUMMARY OF THE STUDY

Majority of respondents, 85 (47.2%) were aged 16–20 years and predominantly female 151 (83.9%). The results show that most respondents had average (47.2%) or poor (43.3%) knowledge of genomics concepts, with only 9.4% demonstrating good knowledge. Most students (62.7%) were not ready to practice genomics nursing. The results show that, there was statistically association between their level of knowledge of genomic concepts and their selected socio-demographic variables such as respondents' age ($\chi^2 = 23.892^a$, p = 0.000, df = 4) and respondents' level of study ($\chi^2 = 65.326^a$, p = 0.000, df = 8).

CONCLUSION

In conclusion, the results revealed that nursing students generally have low to average knowledge of genomics concepts and limited readiness to practice genomics nursing. Age and level of study significantly influenced knowledge, with younger and lower-level students demonstrating poorer understanding. Sex and family history of cancer had no significant effect. These findings underscore the need for enhanced genomics education and practical training within nursing programs to prepare students for effective participation in genomics healthcare.

RECOMMENDATIONS

In view of the study findings, the researcher recommends the following:

1. Curriculum Enhancement: Introduce genomics earlier in the nursing curriculum, using validated tools like the Genomic Nursing Concept Inventory (GNCI) to assess and track knowledge.
2. Educational Strategies: Use innovative teaching methods such as simulation (e.g., standardized-patient scenarios) to build both competence and confidence.
3. Faculty Development: Train faculty in genomic competencies so they can effectively teach and support students. Literature shows faculty often lack sufficient genomic knowledge themselves.
4. Policy / Institutional Support: Advocate for institutional adoption of genomic competencies (e.g., as outlined in genomic nursing competency frameworks) so that knowledge translates into practice.
5. Encourage Further Research: Future studies should explore factors affecting genomic readiness, evaluate the effectiveness of genomic teaching methods, and assess the long-term impact of curricular reforms on students' competency. Multi-center or nationwide studies are also recommended to generalize findings.

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