Assessment of the Knowledge of Nursing Academics in Genetics/Genomics about Breast Cancer

doi: https://doi.org/10.32635/2176-9745.RBC.2021v67n3.1337

Avaliação do Conhecimento dos Acadêmicos de Enfermagem em Genética/Genômica sobre o Câncer de Mama

Evaluación del Conocimiento de Academias de Enfermería en Genética/Genómica sobre el Cáncer de Mama

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ABSTRACT

Introduction: Nursing universities have not kept up with the demands related to the disciplines of genetics, genomics, or oncology to improve the knowledge of students in managing breast cancer, which is the most common among Brazilian women, demanding greater effectiveness of policies for early detection, timely treatment, and genetic counseling. This is partly due to the fact that it is not mandatory to offer these subjects in the curriculum, which can lead to a deficit of knowledge potentially harmful to the future quality of these professionals. **Objective**: To analyze whether the knowledge of nursing students about the concepts of genetics and genomics applied to breast cancer is associated with the curriculum of the institutions where they study. **Method**: Multicenter, cross-sectional study, guided by the STROBE tool, carried out between August-October 2018. **Results**: Students from public institutions showed correlation between the absence of genetics/genomics disciplines (p=0.0001) and poor knowledge of the respective concepts (p=0.0045). Alternatively, those from private institutions showed more errors in relation to the annual clinical breast exam from the age of 40 (p=0.0009) and the frequency of mammographic screening in the population at general risk (p=0.0021). The two groups concurred in recommending mammography to the population at risk between 35 and 69 years of age. **Conclusion**: Students from private universities where genetics is included in the disciplines were more cognizant about concepts of genetics and genomics, while those from public institutions stood out regarding correct responses on breast cancer related health policies because of their internship practice.

Key words: Genetics/education; Genomics/education; Breast Neoplasms; Students; Nursing Evaluation Research.

RESUMO

Introdução: As universidades de enfermagem não têm acompanhado as demandas relativas às disciplinas de genética, genômica ou oncologia para aperfeiçoar o conhecimento dos acadêmicos no manejo do câncer de mama, que é o mais comum entre as mulheres brasileiras, exigindo maior eficácia das políticas de detecção precoce, tratamento oportuno e aconselhamento genético. Isso se deve em parte à não obrigatoriedade de oferecer essas disciplinas na grade curricular, o que pode levar a um déficit de conhecimento e possível prejuízo da futura qualidade desses profissionais. **Objetivo**: Analisar se o conhecimento dos acadêmicos de enfermagem sobre os conceitos de genética e genômica aplicados ao câncer de mama está associado à grade curricular das instituições onde estudam. **Método**: Estudo multicêntrico, transversal, norteado pela ferramenta STROBE, realizado entre agosto/outubro de 2018. **Resultados**: Acadêmicos de instituições públicas apresentaram correlação entre a ausência das disciplinas genética/genômica (p=0,0001) e pouco conhecimento dos respectivos conceitos (p=0,0045). Alternativamente, os de instituições privadas mostraram maiores erros em relação ao exame clínico de mama anual a partir dos 40 anos (p=0,0009) e à periodicidade do rastreio mamográfico na população sob risco geral (p=0,0021). Os dois grupos convergiram na recomendação da mamografia à população sob risco familiar entre 35-69 anos. **Conclusão**: Os acadêmicos das instituições de ensino superior privadas apresentaram maiores acertos sobre conceitos de genética/genômica, pois continham a disciplina genética na grade curricular, enquanto os das instituições públicas se destacaram nos acertos relacionados ao câncer de mama sobre políticas de saúde, em razão da maior vivência prática no estágio curricular.

Palavras-chave: Genética/educação; Genômica/educação; Neoplasias da Mama; Estudantes; Pesquisa em Avaliação de Enfermagem.

RESUMEN

Introducción: Las universidades de enfermería no se han mantenido al día con las demandas relacionadas con las disciplinas de genética, genómica u oncología para mejorar el conocimiento de los académicos en el manejo del cáncer de mama, que es el más común entre las mujeres brasileñas, exigiendo una mayor efectividad de las políticas de detección precoz. tratamiento oportuno y asesoramiento genético. Esto se debe en parte a que no es obligatorio ofrecer estas asignaturas en el plan de estudios, lo que puede conllevar un desconocimiento y posibles daños a la calidad futura de estos profesionales. **Objetivo:** Analizar si el conocimiento de los estudiantes de enfermería sobre los conceptos de genética y genómica aplicados al cáncer de mama está asociado al currículo de las instituciones donde cursan estudios. **Método**: Estudio multicéntrico, transversal, guiado por la herramienta STROBE, realizado entre agosto y octubre de 2018. **Resultados**: Los académicos de las instituciones públicas mostraron una correlación entre la ausencia de disciplinas de genética/genómica (p=0,0001) y el escaso conocimiento de los conceptos respectivos (p=0,0045). Alternativamente, las de instituciones privadas mostraron mayores errores en relación al examen clínico de mama anual a partir de los 40 años (p=0,0009) y la frecuencia de cribado mamográfico en la población de riesgo general (p=0,0021). Los dos grupos convergieron en la recomendación de la mamografía a la población de riesgo entre los 35 y los 69 años. **Conclusión:** Los académicos de las instituciones privadas de educación superior fueron más correctos sobre los conceptos de genética y genómica, ya que incluyeron la disciplina genética en el plan de estudios, mientras que los de las instituciones públicas se destacaron en las respuestas correctas relacionadas con el cáncer de mama en las políticas de salud, debido a la mayor experiencia práctica en la pasantía curricular.

Palabras clave: Genética/educación; Genómica/educación; Neoplasias de la Mama; Estudiantes; Investigación en Evaluación de Enfermería.

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INTRODUCTION

Breast cancer can be defined as the uncontrolled growth of cells of the mammary epithelium tissue resulting from genetic and epigenetic alterations. It is the most common cancer in women with rising prevalence after menopause[1]. 5-10% of the cases are associated with highly invasive inherited genetic defects, and 90-95% related to environmental factors and life style[2].

In Brazil, the increase of the incidence demanded responses from the National Health System and in 2013, the National Policy for Cancer Prevention and Control (PNPCC), in the Health Attention Network within the National Health System (SUS) was created through actions to promote health, prevention, early detection and timely treatment of cancer and the professional formation is one of the guidelines of this policy[3]. The actions and services related to early detection and timely treatment of breast cancer are included in all levels of attention to health in SUS, and the nurse plays a key role in the whole process[4,5]. However, the organization of attention to breast cancer is still challenging because it is fractured and does not ensure the integrality of the care[6].

Oddly, hereditary cancer was not listed in the National Policy of Full Attention to Individuals with Rare Diseases of SUS[7]. This policy was the first to mention genetic counseling as a function of the multi-professional health team requiring knowledge about concepts of genetics and genomic.

In synergy with this progress, the Federal Nursing Council (Cofen) ruled the practice of genetic counseling for the nurse according to its level of technical skill (general and specific)[8] and included Genetics and Molecular Biology in the list of specialization[9]. Nevertheless, not all the universities adopted the epidemiological context and the evolution of the profession.

The National Guidelines of Nursing Undergraduation Courses (DCN/ENF) have been steering the process of Pedagogic Processes based in the concepts of SUS and regional flexibilization according to health-related social necessities[10], leading to scientific autonomy of the curriculum of the Brazilian universities.

It is known that this gap in the professional formation can impact not only the basic and applied research[11], but mainly the care. Studies show that students[12] and nurses[13,14] have limited knowledge about genetics and breast cancer, considering that this professional is essential for early detection, timely treatment and genetic counseling[7].

Considering this context, it is plausible to affirm that discrepancies in the curricula of the universities can result in dissimilar knowledge that nursing students have of genetics and genomics applied to breast cancer. Furthermore, this can impact their practice across every level of care, basically Primary Attention because the nurses can assist the early identification of the disease, risk management, and contribute for the reduction of morbimortality rates. This study attempted to analyze whether the knowledge of nurse students about genetics and genomic applied to breast cancer is associated with the curricula of the faculties.

METHOD

Multicentric, cross-sectional study based in STROBE tool evaluating the knowledge of nurse students from August to October 2018.

The universities were chosen by convenience sample considering the Pedagogic Project of the Course (PPC) available at the institutional site and approval of the university to conduct the study. Seven universities have been invited but two declined, remaining three private (with genetics) and two public (without genetics) in Belém, Pará.

The target-population was 10,869 students enrolled in the nursing faculty (in-person and remote) in Pará's universities in 2017[15], with simple randomization sample, expected frequency of 50% (only in-person attendance) and acceptable margin of error of 5%.

For the sample size, the calculation was made according to the following parameters: estimated population of 10,869 students, expected prevalence of good knowledge of 31% of the students (nursing and community health)[13], accuracy of 5.0%, confidence level of 95.0%, and design effect of 1.0. As such, the minimum sample was 319 participants. The software Epi Info version 7.2.2.16, function StartCalc was utilized to calculate through simple randomization according to the conditions mentioned previously.

Students in the sixth term were enrolled since genetics is offered in the initial semesters. Participants (i) older than 18 years of age; (ii) both sexes; (iii) regularly enrolled as of the sixth semester; (iv) who accepted to participate voluntarily and signed the Informed Consent Form (ICF) were enrolled. The students who did not meet the eligibility criteria were excluded.

A data collection tool based in the "Consensus Essentials of genetic and genomic nursing: competencies, curricula guidelines, and outcome indicators"[16] and in the health-policies related to breast cancer was created due to the lack of questionnaires addressing the variables investigated.

Initially, the questionnaire was submitted to the strategy of Content Validation through the simplified Delphi technique without statistical inference following

the stages: selection of the participants, elaboration of the questionnaires, participation, and validation of the content by experts and analysis of the questionnaires until a consensus was reached[17]. The validation of the content occurred in July 2018. The experts received the invitation-letter, the evaluation tool, and the questionnaire by e-mail. Each item of the questionnaire was evaluated for presentation, clarity, scope of the statement and time of responses and the conclusion should be: agree, disagree and suggestions.

Ten nurses older than 18 years, directly or indirectly associated with oncology, either professors, investigators, or residents of the Multi-professional Residence Program of "*Hospital Universitário João de Barros Barreto*" of "*Universidade Federal do Pará*" participated of the validation. All the suggestions were accepted.

Next, a pilot-study with five nursing students to adjust the tool due to difficulties of understanding of the questions, cohesiveness, and mean time necessary to its completion was conducted. It ensured the improvement of the questionnaire with the elimination of the confounding elements encountered during the testing.

The definitive version of the questionnaire consisted of 19 questions addressing three domains (sociodemographic characterization, basic concepts of genetics and genomic and breast cancer). The questions were dichotomic (true or false) or multiple choice. The data of the pilot-test were not included in the result.

For the collection of the data, all the investigators were trained to ensure an even application of the questionnaire as much as possible. The objectives were presented to the participants individually and in a separate environment to protect their privacy, avoid embarrassment and ensure the voluntary participation.

Upon acceptance and signature of the Informed Consent Form, the authors handed over the questionnaire and left the room. The completion of the questionnaire lasted approximately 15 minutes. Once completed, the questionnaires were put in an unidentified envelope and handed back to the investigator.

The main hypothesis to be tested was to analyze whether the knowledge of the nursing students on genetics and genomic applied to breast cancer is associated with the type of university they attend, public *versus* private. The secondary hypothesis tested was if the characteristics of the students are associated with the universities where they studied.

To test the hypothesis, the variables were categorical. In the first hypothesis, the predictive variable (type of university) was considered while the variables of response were the questions about basic knowledges on genetic and genomic (concept of DNA, of gene, of chromosome, of mutations), on cancer (sporadic or hereditary concept) and about breast cancer (clinical exam, mammography screening and periodicity in women with general or high risk).

Alternatively, to test the secondary hypothesis the predictive variables were: age-range, city, occupational status, having attended genetics classes at the faculty. The variable response was the knowledge about the type of university (public *vs.* private).

The participants were assigned a random alphanumerical code according to the order of when they were approached to protect the anonymity. The data were keyed in a database of the software Epi Info version 7.2.2.16 and the descriptive analysis to describe the population of the study was done in Microsoft Excel®.

The categorical variables were calculated by the absolute and relative frequencies. For the continuous variable (age), an exploratory analysis in the software Minitab 14® was made. Considering the categorical nature of the variables, the Pearson chi-square test and the G test were applied, in the later, the variables with expected frequencies were lower than five. It was adopted level of significance of $p<0.05$ in the software Bioestat 5.3®.

The study complied with Ordinances 466/2012[18] and 510/2016[19] of the National Health Council (CNS) and was approved by the Institutional Review Board (CAAE 56366216.1.3001.0018).

RESULTS

Nearly 323 nursing students with mean age of 27.4±6.6, mostly females (80.18%, n=259/323), from the Metropolitan Region of Belém (96.28%, n= 311/323), who studied exclusively (59.46%, n=64/323) joined the study. About 80.18% (n=259/323) enrolled in private and 19.82% (n= 64/323) in public universities. (Table 1).

The universities evaluated revealed discrepancies in the PPC. The nursing students of private faculties affirmed that genetics was offered while in the public, it wasn't (p=0.0001). The first contact of the students of private faculties took place during the undergraduate degree and in the public faculties, during the undergraduate degree, courses, among others (p=0.0032). Table 2 shows statistically significant association between students of public faculties and not knowing the basic concepts of genetics and genomic (0.0045). The other variables did not associate with the faculties.

The analysis of the results about knowledge of breast cancer revealed association statistically significant between being a student of private faculty and not knowing the recommendation of annual periodicity of breast exam

from 40 years of age (p=0.0009). Additionally, this group failed to acknowledge the periodicity of mammography screening in the general population (0.0021). On the other hand, most of the participants of both groups correctly responded the age-range indicated for mammographic screening for the population with high risk (family) (0.0431), according to Table 3.

DISCUSSION

The present study evaluated the knowledge of nursing students about the basic concepts of genetics and genomics, risk factors and screening of breast cancer. Most of the participants were women between 21 and 30 years of age living in the Metropolitan Region of Belém, dedicated exclusively to undergraduate studies at public universities and studies and/or work at private universities.

There is paucity of publications on the knowledge of Brazilian nursing students about genetics and genomics and the evaluation applied to breast cancer is nonexistent. The results revealed a sociodemographic profile similar to the study of Munroe and Loerzel[12].

The nursing students at private universities affirmed they attended the genetics and genomic classes in undergraduate classes and the public students denied having attended as the study revealed and had contact with the theme in undergraduate classes, courses, or others (p=0.00032).

The discrepancy in the formation of the student is due to the flexibilization of DCN/ENF, dictated by health policies, work market and regionalism. The genetic approach is not quoted directly but sub-represented in the curricula bases of biological and health science[10], being ministered in the initial semesters.

It was identified a high number of hits about the concepts of genetics and genomic by the nursing students with emphasis in private over public universities (p=0.0045). Although one study had revealed similar results about the students' recognition of the clinical applicability of these concepts, there is the possibility that this knowledge is residual from high school[20].

In addition, the distribution of the theoretical and practical workload depends on the teaching theory followed by the faculty[21]. According to the PPC of the public universities, the field practice, experience, and reflection of the student about the care provided for further correlation with the theoretical concepts are more relevant. With this, it is possible to infer that the theoretical workload is bigger and with more content in the private institutions, which justifies the more emphatic affirmations of learning genetics through experience.

The knowledge gaps about the basic concepts of genetics and genomic tend to negatively impact the professional formation and improvements of health conditions of the population and lead to the sub-utilization of the workforce[16,14]. For such, changes of the Brazilian curriculum are essential to follow the epidemiological scenario of cancer in relation to incidence and morbimortality and the evolution of the profession in the complex care provided to this patient.

Table 1. Distribution of the interviewees according to sociodemographic profile per Private and Public University, Belém, Pará, Brazil, 2018

Variables		Private N (259)	%	Public N (64)	%	p
Sex	Male	50	19.3	14	21.9	0.7743[a]
	Female	209	80.7	50	78.1	
Age	≤ 20	13	5.0	2	3.1	1.000[b]
	21 to 30	193	74.5	58	90.6	
	31 to 40	41	15.8	5	7.8	
	41 to 50	11	4.2	1	1.6	
	51 to 60	1	0.4	0	0.0	
	> 60	0	0.0	0	0.0	
City	Metropolitan Area	254	98.1	57	89.1	0.021[b]
	Other Regions	5	1.9	6	9.4	
	Not informed	0	0.0	1	1.6	
Occupational Status	Works and studies	105	40.54	0	0	0.698[b]
	Studies only	154	59.46	64	100	

([a]) Chi-square test.
([b]) Test G.

Table 2. Association of knowledge about genetics and genomics with universities, Belém, Pará, Brazil, 2018

Variables		Private N (259)	%	Public N (64)	%	p
Was genetics a discipline in your academic formation?	Yes	189	73.0	5	7.8	< 0.0001[b]
	No	70	27.0	59	92.2	
What was your first contact with genetics/ genomics?	University	170	65.6	36	56.3	0.0032[b]
	Course	10	3.9	9	14.1	
	Trainee	0	0.0	0	0.0	
	Specialization	0	0.0	0	0.0	
	Master's Degree	0	0.0	0	0.0	
	PhD	0	0.0	0	0.0	
	Other	14	5.4	9	14.1	
	Did not respond	0	0.0	6	9.4	
	No contact	68	26.3	1	1.6	
Concept of DNA	Hits	208	80.3	56	87.5	0.0952[a]
	Missed	51	19.7	6	9.4	
	No response	0	0.0	2	3.1	
Concept of gene	Hits	222	85.7	51	79.7	0.4543[a]
	Missed	37	14.3	12	18.8	
	No response	0	0.0	1	1.6	
Concept of genetics/ genomics	Hits	204	78.8	37	57.8	0.0045[a]
	Missed	54	20.8	24	37.5	
	No response	1	0.4	3	4.7	
Concept of chromosome	Hits	229	88.4	57	89.1	0.941[a]
	Missed	30	11.6	7	10.9	
	No response	0	0.0	0	0.0	
Concept of mutations	Hits	240	92.7	57	89.1	0.7493[a]
	Missed	19	7.3	6	9.4	
	No response	0	0.0	1	1.6	

([a])Chi-square test.
([b])Test G.

Breast cancer is a public health problem, and it is essential to implement the control of the risk factors, correct screening and skilled professionals[4,5]. Most of the students of private institutions misunderstood the recommendation of breast clinical exam from 40 years of age (p=0.00009).

The Ministry of Health recommends breast clinical exam as a standard, systematic, and fixed periodicity (annually) screening method from 40 years of age. It must be performed by the physician or nurse during consultation in primary attention and referred to mammography if needed[22].

The discussion of the basic concepts of genetics and genomic applied to breast cancer in undergraduate degree allows to understand the difference between sporadic and hereditary disease and supports the orientation about the correct interval for cancer screening according to the type of risk the individual is potentially susceptible to[22,14]. However, despite the great epidemiologic appeal, oncology is not a reality in nursing faculties in the State of Pará. The disease is still sub-represented in the same curriculum base of genetics, "molecular and cellular base in the regular and altered processes" or in the curriculum content "nursing care"[10].

Another error of the private students was about the biennial periodicity of the mammographic screening of the general population (p=0.0021). As an alternative, the two groups had a high number of hits regarding the targeted population under relative risk (p=0.0021) or high risk (p=0.0431). Biennial mammography between 50 and

Table 3. Distribution of nursing students in the universities according to knowledge about breast cancer, Belém, Pará, 2018.

Variables		Private		Public		p
		N (259)	%	N (64)	%	
Do most of the breast cancer cases occur because of inherited genetic alterations?	Hits	204	78.76	44	68.75	0.5621[a]
	Missed	54	20.85	15	23.44	
	Not informed	01	0.39	05	7.81	
Do most of the breast cancer cases occur because of genetic alterations associated with environmental factors?	Hits	150	57.92	29	45.31	0.1852[a]
	Missed	109	42.08	32	50.00	
	Not informed	00	0.00	03	4.69	
Are early menarche, late menopause, nulliparity, hormone alterations, sedentarism, overweight, smoking and hormone therapy the leading risk factors for breast cancer?	Hits	241	93.05	57	89.06	0.9748[b]
	Missed	18	6.95	05	7.81	
	Not informed	00	0.00	02	3.13	
Does breast cancer diagnosed in men increase the risk of developing hereditary breast cancer?	Hits	205	79.15	42	65.63	0.1750[a]
	Missed	54	20.85	18	28.13	
	Not informed	00	0.00	04	6.25	
The clinical exam must be done in patients annually from 40 years of age?	Hits	77	29.73	32	50.00	0.0009[a]
	Missed	182	70.27	28	43.75	
	Not informed	00	0.00	04	6.25	
What is the age range indicated for mammographic screening for the general population?	35- 69 years	148	57.14	44	68.75	0.1138[a]
	50- 69 years	108	41.70	18	28.13	
	60-79 years	03	1.16	00	0.00	
	Not informed	00	0.00	02	3.13	
What is the age range indicated for mammographic screening for the population with family risk?	35- 69 years	202	77.99	54	84.38	0.0431[b]
	50- 69 years	46	17.76	07	10.94	
	60-79 years	11	4.25	00	0.00	
	Not informed	00	0.00	03	4.69	
What is the periodicity of mammographic screening in the general population?	1 year	143	55.21	48	75.00	0.0021[a]
	2 years	83	32.05	07	10.94	
	3 years	33	12.74	06	9.38	
	Not informed	00	0.00	03	4.69	

([a])Chi-square test.
([b])Test G.

69 years of age is the only screening strategy recognized for sporadic cancer[22].

This was the first study to evaluate the nursing students' knowledge about mammography periodicity according to the stratification of general or family risk. It is believed that expanded curriculum practice in SUS-associated services will ensure more experience in health policies, leading the students to actions of early detection and timely breast cancer treatment since under nursing supervision, who is the responsible for its performance[4,5].

The study limitations are: (i) curriculum flexibility allowing the lack or sub-representation of the content about genetic and genomic and/or oncology in the PPC of each university; (ii) number of participants of public universities; (iii) regional sampling (State of Pará), which does not allow the generalization of the results for the rest of the country; (iv) paucity of studies available for comparison with the national reality.

CONCLUSION

Women from the Metropolitan Region of Belém enrolled in private universities were predominant among nursing students focused only to academic degree with mean age of 27.4±6.6. The results show that these students understood correctly the concepts of genetics and genomics because genetics was included in the faculty curriculum while the students at public universities understood correctly the concepts of health policies related to breast cancer due to more experience from internship.

It is known that the gaps in professional formation can restrain the nurse's practice in basic and applied research, early detection, and timely treatment of breast cancer as well as in health education that permeates every previous stage. Regrettably, the high morbimortality of the disease and the recognition of the professional practice by the respective associations were not sufficient to adapt to DCN/ENF.

Finally, it is anticipated that the results of this study are able to stimulate reflections about the curriculum of the state universities because of the local demands for qualified professionals. Additional studies are suggested that can positively impact the undergraduate studies, research, and graduation.

CONTRIBUTIONS

Aline Maria Pereira Cruz Ramos contributed for the study conception and/or design, collection, analysis and interpretation of the data, wording, and critical review. Ingrid Renny Silva Palha, Cintia Yolette Urbano Pauxis Aben-Athar, Karolayne Teles Costa, Renata Glaucia Barros da Silva Lopes, Michele Monteiro Sousa, and Glenda Roberta Oliveira Naiff Ferreira participated of the collection, analysis, interpretation of the data, wording, and critical review. All the authors approved the final version to be published.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

FUNDING SOURCES

None.

RFERENCES

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Recebido em 15/12/2020
Aprovado em 10/2/2021