

Determining the Genetic Knowledge Levels of Oncology and Chemotherapy Nurses

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Abstract

BACKGROUND/AIMS: Genetics has a primary role in providing nurses with the ability to know their patients in every respect including preventive and therapeutic care, to diagnose symptoms of existing diseases, and to determine treatment processes and genetic diseases which may occur in future generations. This study was conducted to determine the genetic knowledge levels of oncology and chemotherapy nurses.

MATERIALS AND METHODS: The sample of this study was composed of 101 nurses who were working in oncology and chemotherapy units. This descriptive study was conducted between September 2018 and March 2019. The “Socio-demographic and Nurses’ Characteristics About Genetics Data form” and “Genetic Knowledge test” were used as the data collection tools in this study.

RESULTS: The mean score obtained by the nurses from their answers to those questions relating to the contents about the genetic concepts was 5.01 ± 2.75 ; the mean score they obtained from their answers to those questions about general genetic information was 7.43 ± 1.88 ; and the total genetic knowledge mean score was 12.43 ± 3.78 . No effect of the characteristics of the nurses relating to genetic science on their genetic knowledge levels was determined ($p > 0.05$).

CONCLUSION: It was observed that the genetic knowledge levels of the nurses working in the oncology and chemotherapy units were moderate. However, the nurses cared about developments in genetics and they were ready to provide the correct, appropriate and up-to-date genetic and genomic information, resources, services and/or technologies to their patients.

Keywords: Genetics, genetic science, oncology nursing, chemotherapy nursing

INTRODUCTION

The increase in genetic diseases, high rates of consanguineous marriages in Turkey compared to western countries, and the early diagnosis of genetic diseases with genome and molecular studies have increased the importance of medical genetic information.^{1,2} Unlike many nursing fields, genetics is important at every stage of life and thus, it should be addressed in all patient groups ranging from newborns to geriatric care.³ In different countries, the genetic counseling role of nurses is determined via associations and consensus. In contrast, some

countries, such as Turkey, Hungary, and Germany, have no genetics nurses or counselors.⁴ It is thought that this lack of genetic nursing or counseling increases the importance for nurses to have a full basic genetic knowledge regarding the fields they work in.

Advancements in genetics and especially in oncology, gastroenterology, pediatric and prenatal care fields have led to an increased demand for genetics and genetic healthcare and they have enabled nurses to develop both skill and information competencies about genetics in order to support clinical practices.³

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Nurses need to know the internal and external factors causing cancer, correctly comprehend the principles underlying human genetics, and integrate them into cancer genetics.⁵ Individuals and families are informed and advised about their risks for passing on or inheriting diseases, their genetic and familial risk estimates, their individualized risk management, preventive measures, and their treatment options by including genetics and genomics in the care given by oncology nursing.⁶

Integrating this information into clinical nursing practices by nurses will enhance patient care quality.^{5,7} In order to carry out the best practices for prevention, early diagnosis and/or care of genetic diseases, all nurses should receive education on genetics.⁸ This study aimed to reveal whether nurses have adequate genetic knowledge levels or not. Thus, in the light of this information, it will be possible to make arrangements for in-service training to be planned for oncology and chemotherapy nurses. This study was conducted to determine the genetic knowledge levels of nurses working in oncology and chemotherapy units in private and public hospitals.

MATERIALS AND METHODS

Type of study: This was a descriptive study.

Population-sample: The population of this study was comprised of all the nurses working in the oncology and chemotherapy units of four private hospitals and one state hospital between September 2018 and March 2019. All the nurses working in the aforementioned services were determined as the population. By reaching the whole population, all the nurses, who agreed to participate in the study and who met the inclusion criteria, were included in this study (n=101). No sampling calculation was used to determine the sample size.

This study was conducted at inpatient clinics where patients were suffering from an oncologic disease and required long-term treatment. In addition, those patients with suspected tumor are also hospitalized in these services for follow-up during their diagnosis processes. Chemotherapy units where patients receive chemotherapy with one-day hospitalization and are discharged after the treatment were also included in this study.

Inclusion Criteria of the Study

- *Working in the specified services for at least 3 months,
- * Agreeing to participate in this study.
- * Being 18 years old or over.

Exclusion Criteria

- * Changing the service area between the dates of the study.
- * Being on leave between the dates of the study.

Data collection method: The data were collected via face-to-face interviews. The nurses completed the surveys themselves. It took approximately ten minutes for each nurse to complete the surveys.

Data collection tools: In this study, the “Socio-demographic and Nurses’ characteristics about Genetics Data form” and the “Genetic Knowledge test” were used as the data collection tools.

1. Socio-demographic and Nurses’ Characteristics Regarding Their Genetics Data Form

In this form prepared by the researchers upon a literature review, there are a total of 15 questions including data about the socio-demographic and genetics characteristics of the nurses working in the oncology and chemotherapy units of the specified hospitals.

2. Genetic Knowledge Test

This test which was developed by the researchers in order to determine the competencies of nurses about genetic diseases comprises 20 questions about genetic concepts and genetic knowledge (Appendix 1). It was aimed to prepare questions based on the National Nursing Core Curriculum in order to examine the basic genetic knowledge of the nurses. For these questions, expert opinions were taken from 10 experts including seven faculty members from the nursing department, two faculty members from the molecular biology and genetics and one faculty member from the department of medical biology. The questions were sent to the experts in tables with tabs such as “Question Appropriate”, “Question Not Appropriate”, and “Your Suggestion” added to each questions. The questions were finalized in line with the feedback received from the experts.

There are 10 open-ended questions investigating the definitions of genetic concepts in the knowledge test. In the part questioning genetic information, there are 10 questions with True/False answer options. The highest score the participant can obtain from both parts is 10 and the lowest score is 0. Therefore, the highest score of the overall Genetic Knowledge Test is 20 and the lowest score is 0.

Ethical considerations: In order to conduct this study, written ethics committee approval with number: 2018/14/2 was obtained from the Ethics Committee of Acibadem University. After informing the participants about the study subject, their verbal and written consent was obtained.

Statistical Analysis

SPSS 22.0 software was used to assess the data. Descriptive data were given as number, percentage, and mean. The data were analyzed using the Kruskal-Wallis test, the Mann-Whitney U test and Student’s t-test.

RESULTS

The average age of the nurses participating in this study was 27.49 ± 6.37 years. The average duration of the professional experience of the nurses was 6.15 ± 6.79 years and their duration of working in their current services was 2.96 ± 3.01 years. When examining the demographic characteristics of the nurses; 78.2% of the nurses were women and 66.3% of them were single. When examining the educational background of the nurses, 56.4% of the nurses had a bachelor’s degree (Table 1).

The mean score obtained by the nurses from their answers to the questions about genetic concepts was 5.01 ± 2.75 , their mean score from their answers to the questions about their general genetic information was 7.43 ± 1.88 ; and their total genetic knowledge mean score was 12.43 ± 3.78 .

The negative correlations of the nurses’ professional experience duration and their cancer patients experience duration with their genetic knowledge score was not found to be statistically significant ($p > 0.05$) (Table 2).

Table 1. Socio-demographic characteristics of the nurses (n=101)

Gender	n	%
Female	79	78.2
Male	22	21.8
Marital status		
Married	33	32.7
Single	67	66.3
Educational status		
Health vocational high school	20	19.8
Associate	10	9.9
Undergraduate	57	56.4
Graduate	14	13.9
Position		
Responsible nurse	28	27.7
Intensive care service nurse	73	72.3
Working unit		
Oncology service	55	54.5
Chemotherapy	42	41.6
Internal medicine	4	4.0

Table 2. Correlation between the nurses' professional experience duration and their duration of experience with cancer patients and their genetic knowledge scores

	Genetic knowledge scores, r/p
Duration of professional experience	-0.122/0.224
Duration of experience with cancer patients	-0.076/0.453
Pearson correlation analysis (r) was performed.	

When examining the genetics-related characteristics of the nurses, 27 (27.7%) participants stated that they had received training on genetics and genetic diseases before.

Twenty-one (20.8%) of those who had received this training received it while at school, 14 (13.9%) from in-service training, 15 (14.9%) from books and journals, 12 (11.9%) from seminars/courses/conferences, and 10 (9.9%) from the Internet. Six (5.9%) of the nurses obtained their knowledge about genetics from the media and television and 4 (4%) obtained it from their friends. The associations between the nurses' genetics-related characteristics and their genetic knowledge status were also analyzed. There was no statistically significant difference between the nurses' status of previously receiving any training on genetics/genetic diseases and their genetic knowledge level ($\chi^2=0.054$, $p=0.973$). There was no statistically significant difference between their level of caring about advancements in genetics and their genetic knowledge level ($\chi^2=5.839$, $p=0.054$). There was no statistically significant difference between the nurses' level of being aware of their own values and attitudes relating to genetics which may affect the care given to an individual and their genetic knowledge level ($U=5.839$, $p=0.777$). There was no statistically significant difference between the nurses' status of patients to make informed decision making about the genetics, volunteer in actions and defend autonomy rights and their genetic knowledge level ($U=-1,465$, $p=0.143$). There was no statistically significant difference between the nurses' status of all individuals to identify issues which may affect/prevent the rights of autonomy, making

informed/enlightened decisions about genetics and volunteering in their actions and their genetic knowledge level ($U=-0.473$, $p=0.632$). There was no statistically significant difference between the nurses' level of providing accurate, suitable and up-to-date genetic and genomic information, resources, services and/or technologies to the patients in order to facilitate and support their decision making processes and their genetic knowledge levels ($U=-0.473$, $p=0.632$). There was no statistically significant difference between their level of providing accurate, suitable and up-to-date genetic and genomic information, resources, services and/or technologies to the individuals to facilitate and support their decision making process and their genetic knowledge levels ($t=-0.444$, $p=0.658$). There was no statistically significant difference between nurses' defining ethnic, social, cultural, religious, legal, financial and social issues relating to genomic information and technologies and their genetic knowledge levels ($t=-0.625$, $p=0.533$). There was no statistically significant difference between the effect of the nurses' characteristics about genetics and their genetic knowledge levels ($p>0.05$) (Table 3).

DISCUSSION

Rapid discoveries in genetics and genomics significantly affect all aspects of health care and help in the discovery of new treatments especially for cancer patients or in creating individualized treatment and care opportunities for people at high risk of cancer.⁹ In this study, the genetic knowledge levels of nurses working in oncology and chemotherapy units were evaluated.

It was determined that the genetic knowledge level mean score of the nurses was 12.43 ± 3.78 . Considering that the highest score of the genetic knowledge test is 20, it can be asserted that the nurses' basic genetic knowledge levels were moderate. In other studies investigating nurses' opinions about their roles in genetic fields, it was determined that the nurses' knowledge about basic genetic information was insufficient and they needed training in this field.^{10,11} Seven et al.³ determined that nurses did not have sufficient knowledge about genetics and did not use it in their clinical practice. However, in the same study, it was reported that nurses were ready to learn more about genetics and that genetics should be integrated primarily into nursing education. Similar to the literature, it was determined in the present study that the genetic knowledge level of the nurses was not sufficient.

In the present study, 64.4% of the nurses had not previously received any training about genetics and genetic diseases. 20.8% of those who had received such training reported that they received the training during their professional education. Turaçlar et al.¹² determined that 97.1% of nursing and midwifery students received their genetic knowledge during their undergraduate education and they received 64.4% of this information from the child health and diseases course and 61.7% from the obstetrics and gynecology course during this education. Terzioğlu and Dinç¹⁰ reported that 23.3% of the nurses in their study stated that they had received information about genetics during their professional education but this information was insufficient (Terzioğlu and Dinç¹⁰). Vural et al.¹³ conducted their study with nursing students, and determined that most of the students had "very low" levels of knowledge about genetics but they had a high level of knowledge in terms of awareness about genetic abnormalities and diseases (lung, colon cancer, thalassemia etc.). A great majority of the students (93.9%) stated that they wanted to receive more training about genetic diseases and genetic counseling and this information was limited in their basic nursing education program.¹³ Similarly, low genetic knowledge of oncology and chemotherapy nurses after graduation may be due to the

Table 3. Associations between the nurses' and genetics characteristics and genetic knowledge level (n=101)

	n (%)	Genetic knowledge levels total scores		
		X ± SD	Statistics value	p
Status of receiving any previous training on genetics and genetic diseases				
Yes	28 (27.7)	12.57±3.40	0.973	0.054 ¹
No	65 (64.4)	12.42±4.16		
I do not remember	8 (7.9)	12.00±.92		
Status of caring about the advancements in genetics				
Yes	77 (76.2)	12.95±3.92	5.839	0.054 ¹
No	10 (9.9)	11.00±1.63		
I have no idea	14 (13.9)	10.57±3.34		
Status of being aware of their own values and attitudes related to genetics which may affect the care given to an individual				
Yes	82 (81.2)	12.49±3.76	-0.282	0.777 ²
No	19 (18.8)	12.1579±3.96		
Status of patients to make informed decision making about genetics, volunteer in actions and defend autonomy rights				
Yes	100 (99)	12.48±3.76	-1.465	0.143 ²
No	1 (1)	7.00		
Status of all individuals to identify issues that may affect/prevent the rights of autonomy, making informed/enlightened decisions about genetics, and volunteering in their actions				
Yes	72 (71.3)	12.53±3.63	-0.473	0.632 ²
No	29 (28.8)	12.17±4.18		
Status of providing accurate, suitable and current genetic and genomic information, resources, services and/or technologies to the individuals to facilitate and support their decision-making process				
Yes	68 (67.3)	12.31±3.83	-0.444	0.658 ³
No	33 (32.7)	12.67±3.71		
Defining ethnic, social, cultural, religious, legal, financial and social issues related to genomic information and technologies				
Yes	56 (55.4)	12.21±3.87	-0.625	0.533 ³
No	45 (44.6)	12.69±3.69		

¹Kruskall-Wallis, ²Mann-Whitney U test, ³t-test, SD: standard deviation.

Appendix 1. Match the following concepts related to genetic with their definitions

Genetic knowledge test				
Genetic concepts				TERMS
1) What is the structure that carries the hereditary characters of living individuals and transfers them from generation to generation?				
2) What are the areas where the genes are located on the chromosomes called?				
3) What is the genetic disorder causing down syndrome?				
4) What cell division creates gametes?				
5) What is the genetic material the child inherits only from the mother?				
6) What is the chromosomal abnormality which is also known as "Turner Syndrome"?				
7) What are the genes with the potential of causing cancer when mutated despite having important biological functions in healthy individuals called?				
8) What are the genes with the potential of causing cancer when mutated but prevent cancer formation in cells in healthy individuals called?				
9) What is the condition which may cause a nucleotide change in the DNA?				
10) What is the name of the procedure in which an individual or species is/are ranged on the basis of their number, size and shape after their chromosomes are paired as identical chromosomes?				
a. Trisomy 21	b. Meiosis	c. Genome	d. Monosomy X	e. Tumor suppressor gene
f. Mutation	g. Locus	h. Karyotyping	j. Mitochondrial DNA	k. Proto-oncogen

Specify the following knowledge related to genetic diseases as “true” or “false”		
Genetic knowledge	True	False
1) After completing the human genome project, the meaning of the associations between genetics and diseases has been explained.		
2) Some viral infections may cause cancer.		
3) Cancer is basically a multifactorial disease.		
4) Unless an individual has a genetic disease in their family, neither she/he nor her/his descendants will develop any genetic disease.		
5) Characterized by alpha or beta-globin deficiency; “Thalassemia” is a genetic disease.		
6) There is no repair mechanism in cells to prevent the development of permanent mutations caused by DNA damage.		
7) There is a direct correlation between HPV and cervical cancer.		
8) Mitochondrial DNA is passed on from father to son.		
9) Autosomal inherited genetic diseases are independent of gender.		
10) There is a correlation between the <i>BRCA1</i> or <i>BRCA2</i> gene mutation and hereditary breast or ovary cancer.		
HPV: human papilloma virus.		

fact that genetics is mostly included as a sub-subject in their courses rather than as a separate course integrated in the undergraduate curriculum.

In previous studies, it has been reported that nurses did not have information about delivering genetic-based healthcare service and they did not use it in the clinic.¹⁴⁻¹⁶ A systematic review reported that the genetic and genomic knowledge of nurses was not sufficient to deliver suitable genetic healthcare services, for example, to determine if a condition may be genetic, to understand and explain genetic diseases and its risks to a family or to direct families to specialized services. In a study conducted with nursing students, student nurses stated that preparing a person for a genetic test, taking the medical history of a person, counseling a family before genetic tests, and providing psychological support to the family were their nursing roles and responsibilities. They stated that their levels of dealing with genetic test results, conducting research on genetic test and the counseling process under the roles and responsibilities of nurses were at a very low rate.¹⁶ This may show that the roles and responsibilities of the nurses regarding the use of genetic information have been misplaced in the undergraduate education system and thus, nurses could not improve themselves sufficiently in this field. In the present study, it was thought that the nurses' knowledge levels had no correlation with their duration of experience in providing care to cancer patients or their total duration of professional experience since the nurses have insufficient genetic knowledge and do not use their knowledge about genetics in their clinical practices sufficiently.

CONCLUSION

Consequently, it was observed that the genetic knowledge levels of those nurses working in oncology and chemotherapy units were moderate. However, two important results obtained in this study were that most of nurses working in oncology and chemotherapy units cared about developments in genetics and they are ready to provide accurate, appropriate and up-to-date genetic and genomic information, resources, services, and/or technologies to individuals in order to support and facilitate the decision making of their patients. Therefore, education programs which will increase the knowledge levels of oncology and chemotherapy nurses should be organized and nurses should be supported institutionally. In addition, genetics can be recommended to be included in nursing undergraduate programs in order to improve nurses' roles and responsibilities about genetics.

MAIN POINTS

- The nurses' knowledge about basic genetic information was insufficient and they need education in this field
- The nurses' knowledge levels had no correlation with their duration of experience in providing care to cancer patients or the total duration of their professional experience
- There was no difference between the genetic information levels with respect to the characteristics of the nurses related to genetic science.

ETHICS

Ethics Committee Approval: In order to conduct this study, written ethics committee approval with number: 2018/14/2 was obtained from the Ethics Committee of Acibadem University.

Informed Consent: Written informed consent was obtained from the nurses who participated in this study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: V.K., Design: V.K., D.Y., M.Y., Supervision: V.K., D.Y., Fundings: V.K., D.Y., M.Y., Data Collection and/or Processing: V.K., D.Y., Analysis and/or Interpretation: V.K., Literature Search: V.K., D.Y., M.Y., Writing: V.K., D.Y., Critical Review: V.K., D.Y., M.Y.

DISCLOSURES

Conflict of Interest: The authors have no conflicts of interest to declare.

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