

The Nurses' Knowledge and Perception of Their Role in Genetics

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Purpose. The purpose of the study was to assess the level of nurses' genetic knowledge and the perception of nurses' role in genetics. The ultimate goal of this paper is to educate practicing nurses so that they can counsel individuals and families with genetic problems, on the basis of better understanding of genetic diseases.

Methods. A total of 969 clinical nurses in 11 general hospitals completed a self-administered questionnaire including basic genetic knowledge and perception of their role. The instruments were made by the author with the help of some experts on genetics. T-test, ANOVA, and Pearson Correlation were used to analyze the data.

Results. The results of this study indicated that nurses revealed a vast knowledge deficit in genetics and the need for genetic content in nursing curriculum. The results also showed that nurses' sources of information about genetics largely came from the mass media. The nurses also expressed great interest in educating and counseling patients. Overall, the survey found a positive correlation between the nurses' level of knowledge and their degree of interest in genetics.

Conclusion. In conclusion, education and training of clinical nurses in genetics is critical in integrating genetics with nursing science. Therefore, the development of educational programs for nursing knowledge and counseling as well as basic curriculums in genetic nursing at universities are essential in the near future.

Key Words: Genetics, Genetic knowledge, Perceived role of nurses

INTRODUCTION

Importance of the Study

We are entering into a post genome era due to The Human Genome Project that completely changes the paradigm of diagnosis and treatment of human diseases as well as understanding of mankind (Um, 2001). It is true that new genetic technologies are moving rapidly from research into the clinical practice arena with the knowledge and molecular techniques that will continue to emerge from The Human Genome Project.

All diseases have a genetic component (Anderson,

1996). In the past, genetics has long been recognized as having an important part in maternal-child nursing. However, the new paradigm is to view genetics as a science basic to the practice of nursing. Primary care providers, including nurses regardless of their specialty, will be increasingly challenged to integrate new genetic knowledge into their practice in order to ensure that patients and families affected with genetic-related health conditions receive quality genetic health services. Recent progress in the Human Genome Project has stimulated changes in health care, which, in turn, demands changes in existing educational programs for nurses to prepare contemporary and future nursing clinicians (George,

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1992).

In addition, The Human Genome Project has also recognized from its inception its responsibility not only to develop gene-finding and analysis technology, but also to address the broader societal implications of these new-found abilities to provide genetic information. So the project commits 5 percent of its annual research budget to a program that addresses the ethical, legal, and social implications of genome research (Collins, 1999). What this implies is that health care professionals can be questioned as to whether or not they have been adequately educated about genetics, genetic technologies and the ethical, legal, and social implications surrounding their use in order to optimally provide genetic services to their patients.

It is critical that nurses in nearly all settings be informed about human genetics, genetic testing, and the associated ethical, social and legal issues because they are at the forefront in identifying, assessing, and counseling patients and families with or at risk of genetic conditions. However, the nursing profession lags behind other disciplines in educating its members about genetics (Lea, 2001). Um (2001) expressed her anxiety by saying that if the nursing community does not subjectively integrate currently developing biotechnology into its discipline, it can only accept medical interpretation and views of biotechnology, making nursing knowledge too dependent on medical discipline.

If we look at prior research on genetic nursing, widespread dissemination of genetic information to nurses is missing despite rapid advances in genetic diagnosis and gene therapy (Forsman, 1994; McElhinney & Lajkovicz, 1994; Thomson, 1993). According to Anderson (1996), from 1976 to 1994, only nine studies were conducted to explore nurses' knowledge and usage of genetic information. So, it is true that internationally there is a lack of nursing research related to genetics. Under such circumstance, George (1992) points out that the lack of genetics-related nursing research creates a vicious cycle with the lack of genetics in nursing education. Furthermore, he worries that without education in this area, nurses are less likely to raise or investigate questions related to genetics and without nursing research in genetics and nursing, an important source of information for education will be lost.

Since genetic science is yet to be integrated into nursing science in Korea, there is no research conducted on genetic nursing. So, the author focused on the kind of

questions that can be suggested to practicing nurses related to genetics and the kind of phenomenon that should be emphasized by them. The author tried to seek baseline data through administering a survey. In this context, research on the clinical nurses' perception of their role and their knowledge in genetics is called for prior to any further research regarding this issue.

Purpose of the Study

This research aims to define the role of nurses as well as to further develop genetic nursing by investigating the level of nurses' knowledge of genetics and their perceived role in this field. The ultimate goal of the study is to educate nurses so that they can provide more quality services and treatments to patients with genetic diseases and their families.

The specific goals of the study were to assess the level of knowledge about genetics in nursing, and to assess the perception of nurses' role.

LITERATURE REVIEW

Genetic disease and congenital malformations occur in approximately 3-5% of all live births. Increasingly, we are recognizing the role of genetic factors in common illness such as cancer, diabetes, neuropsychiatric disorders, cardiovascular disease, and atherosclerosis. Almost 40,000 recognized disorders with a genetic component are responsible for some of the most devastating diseases faced by man (Sachs & Korf, 1993).

Genetic knowledge now has implications for all areas of health and disease management and nursing practice. This creates a challenge for change in nursing education to meet changing needs in health care delivery. Thus, all licensed nurses, regardless of their work setting, have a role in the delivery of genetics services and the management of genetic information. Nurses require genetic knowledge to support and care for patient affected by genetic disease.

McElhinney and Lajkovicz (1994) ask what the nursing profession is doing to prepare tomorrow's practitioners for this new genetics revolution. In the future, nurses will be the technicians to assist with the technical genetic manipulation. In addition, nurses will be counselors to explain the benefits of gene therapy versus traditional therapy for a specific disease. Nurses can also function as teachers to explain the rationale behind screening for numerous genetic diseases.

Nurses are expected to have a significant role in caring for patients with genetic predispositions or disorders. To carry out this role effectively and efficiently, they must be able to 1) identify hereditary, familial, environmental and lifestyle characteristics that increase individual and family members' risk for disease, 2) facilitate informed decision making, 3) promote behaviors that facilitate surveillance and reduce disease risks, 4) identify, refer and/or prescribe appropriate disease management strategies, and 5) advocate publicly and politically promotion of optimal health care, including genetic health care for all desiring it (Baltimore, 2002). In short, by carrying the roles of a counselor, technician, care manager, and teacher for patients and their families, nurses will have an opportunity to expand as well as to create new leadership roles in health care.

As early as in 1962, Brantal and Esslinger, two nursing educators, recommended that human genetics be included in the content of basic nursing education. They said that knowledge of genetics was needed by nurses "to enhance and enrich the care of patients and their families" (Forsman, 1994). There are frequent mentions or discussions of new findings in genetics in the daily news, popular magazines (Reilly, 1994), but not directly to relevant articles on human genetics or genetics education (Anderson, 1996). If plans for appropriate educational change and establishment of differentiated nursing care delivery standards are not developed now, nursing will lose the opportunity to have a significant impact on the future of the profession and the future of health care. Until now, nursing research in genetics was in two categories, exploring nurses' knowledge of genetics (Cohen, 1979; McLean, 1976; Scanlon & Fibison, 1995; Williams, 1983; Zander, 1985) and determining whether or not basic genetic concepts are taught in nursing curriculum (Mertens, Hendrix & Morris, 1984; Monsen, 1984). According to a survey for professors in nursing departments on nursing students' curriculum (Mertens, Hendrix & Morris, 1984), roughly half of all respondents indicated that no clinical experiences with genetic defects/diseases are required in their programs. Yet 96.8% of the respondents felt that a nurse should have a role in health education with respect to genetic diseases, and 90.8% felt a nurse ought to have sufficient knowledge of human genetics to provide preliminary counseling and referral.

Thus, all practicing nurses, regardless of their practicing field, should be able to explain about professional

services related to basic genetic treatments. For that purpose, it's important to check practicing nurses' knowledge and their role perception in genetic nursing.

METHOD

Design of the Study

This research was to survey the level of genetic knowledge and awareness of nurses' role in genetics.

Sample

The respondents of the survey are clinical nurses employed in all practice settings of 11 general hospitals in large cities, including Seoul. The total number of study subjects was 969.

Data Collection

The study period was one month, from July 20 to August 22, 2002. The questionnaires developed for the study were distributed to each institutions with permission of department managers and total of 980 nurses in all units were asked to fill out the questionnaires: 530 in Seoul, 450 in other cities. Eight page long questionnaires were prepared, and 969 copies were returned with the return rates of 98.8 %.

The reasons for such high return rate are, first, the manager of the research made direct phone calls to the managers of the hospitals for cooperation. Second, hospitals displayed special interests on the topic of research and felt the need of the research. Finally, a promise had been made to inform the respondents about the research results.

Instrument

Questionnaire items were designed to measure respondents' demographic background with 13 questions, level of basic genetic knowledge with 25 questions, and the perception of their roles with 30 questions. Items measuring genetic knowledge were reviewed from a genetics textbook and adapted from questionnaires used in other studies of health care professionals' knowledge regarding genetics (Kim, 1999; Estabrooks, 1996; Mertens, Hendrix, & Henrikson, 1979; Paterson, Rieger, Marani, Moor, & Gritz, 2001).

Content validity of the study was established by one oncologist, one geneticist, and two nursing professors who majored in genetics. They critiqued each item twice respectively. They evaluated whether or not the study

contains all the basic questions on genetics. Questionnaire consists of 16 categories with 25 questions in all. A pilot study was conducted with 30 clinical nurses. Based on the result of the pilot study, clarity and flow of the questions were improved. Questions were originally 'true' or 'false' questions in the pilot study. But it turned out to be very inappropriate for nurses marked

the answers without true knowledge of the questions asked. So, questions were fixed to Likert-type scale questions. A Likert-type scale with ratings from 1 to 4 was used for the knowledge part. Respondents chose from the scale of full ignorance, little ignorance, little knowledge, and full knowledge. The higher the score, the more respondents knew about genetics. The reliabili-

Table 1. Demographic Background

(N=969)

Variables	Classification	Frequency	Percent
Age	21-25 years	348	35.9
	26-30 years	319	32.9
	31-35 years	142	14.7
	6-40 years	67	6.9
	over 41 years	93	9.6
Work Experience	less than 5 years	480	49.5
	more than 5 years-less than 10 years	266	27.5
	more than 10 years-less than 15 years	106	10.9
	more than 15 years-less than 20 years	62	6.4
	more than 20 years	55	5.7
Department	Internal Medicine	233	24.0
	Surgery	275	28.4
	Obstetrics & Gynecology	91	9.4
	Pediatrics	100	10.3
	Intensive Care Unit	138	14.2
Education	Specialized Unit	132	13.6
	3-year college degree	537	55.4
	College of the Air or Correspondence	113	11.7
	Baccalaureate	240	24.8
Status	above masters degree	79	8.2
	Staff Nurse	764	78.8
	Charge Nurse	102	10.5
Marital Status	Head Nurse	104	10.7
	Married	340	35.1
	Single	629	64.9
Religion	Protestant	327	33.7
	Catholic	138	14.2
	Buddhist	108	11.1
	Atheist	396	40.9
Nursing Experience with genetic disease	yes	728	75.1
	no	241	24.9
Asked to give counseling	yes	329	34.0
	no	640	66.0
Counseling Experience	yes	49	14.9
	no	280	85.1
The reason for Failure	Ignorance	145	51.8
	Not having nurse's responsibility	15	5.4
	No time	86	30.7
	No experience	34	12.1
Nursing Unit most relevant to genetic disease		Pct of cases	Pct of response
	Internal Medicine	798	33.2
	Surgery	482	20.1
	Intensive Care Unit	124	5.2
	Obstetrics & Gynecology	296	12.3
	Pediatrics	476	19.8
	Neuropsychiatry	165	6.9
Hemodialysis Room	65	2.7	

ty of the level of knowledge in genetics was calculated as 0.91 using Cronbach's Alpha Coefficient (Table 2).

Questions related to perceived role of nurses in genetics were made by the author based on literature review and the current controversial genetic issues (Biesecker, 1997; Engelking, 1995; Giarelli & Jacobs, 2000). Questions were revised, supplemented, finalized to 30 questions with the help of professors in the nursing department who majored in genetics.

Thirty questions consist of eight categories. Those categories are nurses' interest in genetics, motivation for their interest, ways to fulfill nurses' intelligent curiosity about genetics, their participation in genetics, the necessity for genetic curriculum in nursing schools, the neces-

sity for education programs on genetics, the ethical issues of genetics and negative factors of genetics. Out of those eight categories, respondents were asked to answer multiple response questions for reasons for their interest in genetics and ways to fulfill their curiosity. The Rest of the categories were surveyed with Likert-type scale from 1 to 4. Unnecessary counts as one point, somewhat unnecessary counts as two, necessary counts as three, very necessary counts as four points. The higher the point, the more perceptive they are. The reliability of the nurses' level of awareness of their roles was calculated as 0.86 using Cronbach's Alpha Coefficient.

Table 2. The Level of Knowledge in Genetics

Items	Mean ±SD	Corrected Item-Total Correlation	Alpha If Item Deleted
Gene mapping	2.74 ±.77	.4195	.9133
The chromosomal basis of heredity	2.44 ±.51	.6514	.9055
Prenatal diagnosis of genetic disease	2.39 ±.66	.5593	.9076
Mendelian inheritance	2.32 ±.70	.5671	.9075
Single gene inheritance	2.31 ±.72	.5813	.9071
Population genetics	2.30 ±.65	.5749	.9071
Chromosomal aberrations	2.29 ±.53	.7152	.9037
Immunogenetics	2.26 ±.75	.6141	.9059
The molecular basis of inheritance	2.13 ±.49	.7706	.9029
Genetic counseling	2.12 ±.67	.6109	.9060
Variation in gene expression	2.05 ±.58	.7298	.9027
Blood groups	2.03 ±.71	.5588	.9078
Human Genome Project	2.02 ±.53	.6804	.9045
Biochemical genetics	1.96 ±.55	.6798	.9044
Linkage inheritance	1.89 ±.65	.5805	.9069
Dermatoglyphics	1.86 ±.67	.5749	.9071
Average	2.19 ±.63		

Table 3. Motivation for Interest in Genetics and Way of Obtaining Genetic Knowledge

Categories	Classification	Count	Pct of response	Pct of cases
Motivation for interest in genetics	Vital clinical issue through mass media	251	30.6	53.4
	Preparation for future role of nurse	80	9.8	17.0
	Unique characteristics of the unit	75	9.1	16.0
	To improve patient understanding of disease and treatment	208	25.4	44.3
	Personal curiosity about birth and death of living organ	130	15.9	27.7
	To extend nursing knowledge body about unresearched field	76	9.3	16.2
	Total response		820	100.0
Way of obtaining genetic knowledge	Internet	164	22.4	34.9
	Mass media	258	35.2	54.9
	Experts or senior nurses	53	7.2	11.3
	Books	201	27.4	42.8
	Symposium and seminar	32	4.4	6.8
	Consultation with patient and family	25	3.4	5.3
Total response		733	100.0	156.0

Data Analysis

The SPSS program was used for data analysis. Demographic characteristics were analyzed with frequency and percentage while the level of genetic knowledge and the perception of nurses' role in genetic nursing were analyzed with average, standard deviation and multiple response questions. Genetic knowledge's and perception's difference according to demographic background were analyzed with t-test and ANOVA. The relationship between the level of knowledge and perception was calculated with the Pearson Correlation Coefficient.

RESULTS

Sample Characteristics

The demographic characteristics of the subjects are presented in table 1.

The average age was 29, and 35.9% of the respon-

dents were between the ages of 21 to 25. Forty five point five percent had less than five years working experience and the average was seven years with practicing experiences ranging from one to 30 years. In terms of department, 28.4% worked in surgery. Regarding education, 55.4% graduated from 3-year colleges. In terms of status, 78.8% were staff nurses.

Majority of the nurses (75.1%) replied that they had experience caring for patients with genetic diseases. Thirty four percent replied that they had been asked to give counseling about genetic diseases for families or patients, while out of those 34%, 49 respondents (14.9%) said they actually provided counseling to patients. The number one reason for not being able to provide counseling was lack of knowledge with 51.8%, followed by lack of time with 30.7%.

As to the question of nursing units most relevant to genetic disease, 33.2% answered internal medicine; 20.1%, surgery department; 19.8%, pediatrics. According to case, internal medicine ranked the top with 96%, followed by surgery with 58%. What's significant is that 10 percent of the respondents replied that genetic diseases are relevant to all units

The level of knowledge in genetics

The nurses identified themselves as below average in their knowledge of clinical genetics. On a scale from 1 to 4, the average was 2.19, which means they are a "little ignorant". Items such as pedigree, sex chromosome and basic cell composition were better known to nurses, while they replied that dermatoglyphics and linkage inheritance were most unfamiliar (Table 2).

Table 4. Field Requiring Nurse's Involvement and Interest

Categories	Classification	Mean ± SD
Field requiring nurse's involvement	Counseling	3.38 ± .59
	Education	3.36 ± .59
	Diagnosis	2.79 ± .67
	Research	3.05 ± .64
	Treatment	2.90 ± .60
	Testing	2.87 ± .63
	Average	3.07 ± .44
Field requiring nurse's interest	Follow-up care	3.42 ± .58
	Family history and pedigree	3.27 ± .56
	Counseling technique	3.41 ± .57
	Ethical, Legal issue	3.25 ± .60
	Average	3.34 ± .46

Table 5. Ethical Issues and Negative Effects of Genetic Disease Treatment

Categories	Classification	Mean ± SD
Ethical issues of genetic disease treatment	Confidentiality of genetic information and protection of privacy	3.53 ± .54
	Patient's right to know in the process of treatment	3.44 ± .54
	Prior agreement to protect patient	3.40 ± .55
	Guidance and regulation in life safety & ethics	3.38 ± .57
	Need for organizing ethics committee	3.39 ± .45
	Average	3.39 ± .45
Negative effects of genetic disease treatment	Violation of human dignity due to experiment of human embryos	3.45 ± .62
	Violation of human rights and privacy	3.32 ± .63
	Commercialization of genetic information	3.31 ± .64
	Risk of gene modification	3.28 ± .64
	Deterministic way of thinking	3.22 ± .65
	Risk of gene discrimination according to genes	3.20 ± .62
	Unbalanced allocation of research benefit	3.07 ± .66
Average	3.26 ± .49	

The perception of nurses' role in genetics

On a scale from 1 to 4, the average level of interest in genetics was 2.44. Thirty point six percent said they were motivated to have interest in genetics through watching or reading mass media programs on vital clinical issues. Fifty seven point six percent replied that mass media and the internet were their main sources of information (Table 3).

Nurses emphasized involvement in counseling, education, supervision more than diagnosis and testing. Nurses recognized the importance of follow-up care in order to prevent genetic diseases in patients. They also showed interest in counseling techniques (Table 4).

The respondents gave confidentiality of genetic information and the protection of privacy as the most important issues in clinical practice. As to the side effects of genetic treatment, respondents worried about possible violation of human dignity by cloning human embryos (Table 5).

The respondents felt it was necessary to have genetic nursing course in school curriculum by scoring 2.98 on average. Furthermore, 2.99 was scored as to the necessity of an education program on genetic disease patients.

Differences in the level of knowledge according to demographic background

The variables such as age, working years, working department, education, status, counseling request, and counseling experience had significant differences with the level of knowledge in genetics (Table 6).

The lowest age group of respondents, 21-25 and the highest, over 41 years showed the highest level of genetic knowledge with the average of 2.23. Nurses with less than five years working experience, and those with more than 20 years of working experience had the highest level of genetic knowledge.

Regarding the differences in genetic knowledge level according to working department, the result of Scheffe testing showed that nurses in internal medicine and OB-GY had a significantly higher level of genetic knowledge than those in ICU or in special unit. Nurses with at least a baccalaureate degree showed the highest level of knowledge. The result of Scheffe testing showed that nursing graduates of a 4 year college had a significantly higher level of genetic knowledge than those of a 3 year college or of college of the Air or Correspondence. As to the difference of knowledge level according to status,

Table 6. The knowledge Score in Genetics According to Demographic Background (N=969)

Variables	Classification	Number	Mean \pm SD	F or t	p	Scheffe
Age	21-25years	348	2.23 \pm .39	2.996	.018	A
	26-30years	310	2.17 \pm .43			
	31-35years	142	2.09 \pm .41			
	36-40years	67	2.22 \pm .38			
	over 41years	93	2.23 \pm .47			
Work Experience	less than 5years	479	2.23 \pm .39	2.943	.020	A
	more than 5 years-less than 10 years	265	2.14 \pm .43			
	more than 10 years-less than 15 years	106	2.14 \pm .43			
	more than 15 years-less than 20 years	62	2.17 \pm .47			
	more than 20 years	54	2.27 \pm .38			
Department	Internal Medicine	232	2.26 \pm .42	7.779	.000	A
	Surgery	275	2.19 \pm .39			
	Obstetrics & Gynecology	91	2.33 \pm .33			
	Pediatrics	100	2.21 \pm .44			
	Intensive Care Unit	136	2.21 \pm .44			
	Specialized Unit	132	2.19 \pm .42			
Education	3-year college degree	536	2.17 \pm .39	5.692	.001	A
	College of the Air or Correspondence	111	2.08 \pm .46			
	Baccalaureate	240	2.26 \pm .41			
	above masters degree	79	2.25 \pm .42			
Status	Staff Nurse	763	2.16 \pm .42	5.988	.003	A
	Charge Nurse	102	2.28 \pm .39			
	Head Nurse	103	2.28 \pm .41			
Asked to give counseling	yes	327	2.24 \pm .42	3.026	.003	A
	no	639	2.16 \pm .40			
Counseling Experience	yes	49	2.25 \pm .43	2.563	.013	A
	no	280	2.08 \pm .41			

nurses in positions higher than charge nurse had the highest level of genetic knowledge while staff nurse's genetic knowledge was significantly lower than that of charge nurse and head nurse. Nurses who were requested to give counseling to patients and those who have actually provided counseling to patients had significantly higher level of genetic knowledge than those who do not have such experiences.

Differences in the level of interest in Genetics according to demographic background

The variables such as age, working years, working department, education, status, nursing experience with genetic diseases had the significant differences in the level of genetic interest (Table 7).

Nurses in 36–40 years of age group have a higher level of genetic interest than 21–25 years of age group. Nurses with 15–20 years of career have a significantly higher level of interest in genetics than those with less than five years of working experience. Nurses with at least master's degree had significantly higher interest than 3 year college and 4 year college graduates. Nurses in positions higher than head nurse had significantly higher interest than staff nurse and charge nurse. Nurses with experi-

ence treating patients with genetic diseases have higher interest than those who don't have such experiences.

The correlation between the level of knowledge and the level of interest

The correlation between the level of knowledge and the level of interest had a positive significant relationship ($r=.242, p=.000$). Regarding correlation between sub-items of nurses' perception of their role section, there were a positive significant correlation between the level of interest and possible ethical issues and negative factors that can be raised ($r=.185, p=.000$; $r=.267, p=.000$).

DISCUSSION

The paradigm shift of genetics has suggested that genetics be considered as a basic and an important part of the preliminary science of nursing practice. What kind of effect will this change have on nursing practice?

The study investigated the level of nurses' genetic knowledge. It turned out that with the Likert type scale from 1 to 4, the average was 2.19, which means that nurses are a 'little ignorant'. This study result accords

Table 7. Difference in the Level of Interests in Genetics according to Demographic Background

(N=969)

Variables	Classification	Number	Mean ± SD	F or t	p	Scheffe
Age	21-25years	348	2.38 ± .65	3.841	.004	A
	26-30years	319	2.42 ± .68			
	31-35years	142	2.45 ± .65			
	36-40years	67	2.67 ± .61			
	over 41years	93	2.57 ± .71			
Work Experience	less than 5years	480	2.38 ± .66	3.858	.004	A
	more than 5 years-less than 10 years	266	2.45 ± .67			
	more than 10 years-less than 15 years	106	2.67 ± .59			
	more than 15 years-less than 20 years	62	2.68 ± .72			
	more than 20 years	55	2.58 ± .71			
Department	Internal Medicine	233	2.37 ± .69	2.629	.023	A
	Surgery	275	2.39 ± .67			
	Obstetrics & Gynecology	91	2.58 ± .65			
	Pediatrics	100	2.50 ± .66			
	Intensive Care Unit	138	2.41 ± .66			
	Specialized Unit	132	2.55 ± .63			
Education	3-year college degree	537	2.37 ± .66	10.575	.000	A
	College of the Air or Correspondence	113	2.43 ± .61			
	Baccalaureate	240	2.48 ± .68			
	above masters degree	79	2.81 ± .66			
Status	Staff Nurse	763	2.40 ± .66	8.381	.000	A
	Charge Nurse	102	2.45 ± .75			
	Head Nurse	103	2.69 ± .58			
Nursing Experience with genetic disease	Yes	329	2.57 ± .68	4.243	.000	B
	no	640	2.38 ± .65			

with the result of Scanlon and Fibison study (1995) in which 68% of the respondents were 'not much knowledgeable'. However, most of the respondents who are acquiring genetic knowledge said that their knowledge comes from the mass media. So, the result suggests that genetic knowledge should be obtained as professional knowledge rather than common sense. Many recent studies on genetic knowledge indicate that there is an urgent need for genetic knowledge in nursing (Anderson, 1996; Forsman, 1988; Mertens, Hendrix & Morris, 1984; Monsen, 1992). Especially, in the Mosen and Arkansas (1984) study, several respondents commented that genetics is taught in prerequisite natural science courses such as in biology, anatomy, and physiology.

Nursing deals with human beings. Despite the large proportion genetic components take up in human illness and disease, the absence of understanding genetic endowment and how it underpins all human illness and disease, make us think about "holism" as a metaparadigm concept for nursing. As a result, a holistic approach to nursing means that nurses should have the basic knowledge of how genetics influences human health.

The result of the study showed that nurses who were asked to give counseling and those who actually provided it had a significantly higher level of genetic knowledge than those who haven't had those experiences. Thus, an assumption can be made that nurses acquire genetic knowledge while providing genetics related services to patients in practice. However, those who couldn't provide genetics related services to patients replied that lack of knowledge was the main reason for their not being able to provide genetic services. This study shows that there is a need to adopt genetic knowledge in nursing. What's more important is that nurses not only acquire knowledge through their experiences in practice but they also become more motivated to have interest in genetics. For that reason, it is important for nurses to be educated with knowledge needed to practice consistently.

Age and working years were also important in the degree of knowledge manifested. The lowest age group of respondents, 21-25 and the highest, over 41 years showed the highest level of genetic knowledge, which is somewhat different from other international studies that shows younger respondents had higher level of genetic knowledge (Forsman, 1988). Such finding is a reflection of concerns of older respondents who have deep interest in negative effects of genetics and its ethical issues. On

the other hand, the younger group of respondents had less interest in ethical, social issues of genetics despite their high level of knowledge, which implies that ethical, social issues must be included in genetic education for nurses.

Thus, that genetics education for all nurses should be a professional priority is incontrovertible (Monsen, 1992). This study also indicated that nurses had a low level of knowledge despite a high awareness of genetics. Furthermore, genetics related contents in the nursing curriculum are inappropriate in every stage. So, it is inevitable that nursing academia should adopt genetics in its school curriculum. However, precautions should be taken when applying genetics to nursing science. Nursing specialists in genetics have adopted standards and protocol without critical reflection of the assumptions and principles; and have not developed nursing research to guide practices (Anderson, 1996). Nursing specialists need to take the critiques seriously.

Since genetics is related to every field of nursing, genetics' new influence on every sector of nursing should be investigated. For that reason, it is high time for us to think about the necessity of inclusion of genetics in every education curriculum for nurses.

CONCLUSION

Effects of the human genome project have raised awareness among health care providers about the necessity of providing appropriate information on genetics and consulting skills. This trend is also found in Korea. However, despite the significance of the issue and the great amount of time nurses spend with patients, they are not well trained or educated in genetics. Consequently, effective nursing for patients and families with genetic disorders is undermined due to the lack of knowledge in biotechnology and bioethics. The result of the study was that nurses had high awareness of genetics despite their low level of knowledge.

The results indicate a need to raise the consciousness and knowledge of nurses about human genetic disorders before serious repercussions result from inappropriate and inadequate counseling, health teaching and referrals. It means that appropriate genetic components should be included in nursing curriculum. Moreover, the study findings imply that the result of the study needs to be applied so that genetics can be adopted in nursing curriculum.

To remain viable, the nursing profession must reflect these directions. Nursing must first, include appropriate genetic contents in nursing curriculum, second, disseminate genetic information through educational programs for nursing knowledge and counseling, third, come to terms with the ethical issues presented, all nursing communities need to participate actively in the debate surrounding the ethical and legal implications of genetic nursing, and finally, increase the research related to genetic nursing.

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