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Pilot Study of Nursing Students' Knowledge towards Genetic Topics

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ABSTRACT

Backgrounds: Nowadays, the science of genetics in Indonesia has not touched the world of nursing education and practice in health care. As the first step in order to introduce genetics topic into nursing education, an assessment is needed to identify student's knowledge and comfort toward genetics topic.
Purpose: The aim of this pilot study was to identify nursing students' knowledge about genetics.
Methods: Research design used in this pilot study was descriptive with cross-sectional approach. The survey was conducted using a questionnaire that adopted and adapted from "The Genetic Needs Assessment Survey" developed by Maradique et.al. This questionnaire was distributed to nursing students at one state school of nursing in Central Java, Indonesia.
Result: There were 170 nursing students participated in the pilot study. Descriptive statistic was performed and the results indicated that they were lack of knowledge about genetics topic. Most of students were not familiar to genetic terms, for example locus, missense mutation, nonsense mutation, frameshift mutation, and karyotype. Students were not comfortable to use OMIM and draw pedigree. Respondents argued that more education strategy could be applied to improve student knowledge and understanding of the genetics.
Conclusion: Introduction and recognition of genetics topic in nursing education was needed. Integration of genetics topic into nursing education can be applied by the existing subject or by itself subject to students; either individually or classically.

Keywords: students' knowledge, genetics, nursing, education.

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BACKGROUND

Genetics and/ or genomics is a central of science that affects all of healthcare, including nursing. It is essentially all diseases and conditions have a genetic and/ or genomics aspect.(Consensus-Panel, 2008; Lashley, 2001) The fast development of genetics science provides opportunities for healthcare education to incorporate genetics in curriculum, especially nursing curriculum. The International Society of Nurses in Genetics (ISONG), as genetic nurse organization, has developed genetics nursing standards that involve nurses in genetics practice in order to improve nursing care related to issues and genetic information.(ANA, 2007) Nurses play an important role to link the gap between genomic findinds and the human experience of diseases.(Daack-hirsch et al., 2013)

In Indonesia, the development of genetics science, especially clinical genetics, has been developed rapidly. However, it is still lack and far compared to other countries. Beside that nursing has still less aware about genetic condition. Genetic disorder has not been included in the discussion of nursing education and practice yet. Furthermore, the genetics science was not included as one of the competencies in the nursing curriculum that must be understood by student. Understanding of basic genetic and/ or genomics terms and concepts can provide a foundation that will enable nursing profession to provide competent and holistic healthcare.(Lea, 2009)

Far from Indonesian nursing condition, American Nurses Association stresses that every nursing curriculum should include genetics coverage at any levels of education. One of research study stated that strategic plan is needed to accommodate these components into nursing curricula and practice.(Calzone, Jenkins, Prows, & Masny, 2011) On the other study, Jenkins provided a recommendation in order to insert genetic information to nursing curriculum.(J F Jenkins, Prows, Dimond, Monsen, & Williams, 2001; Jean F. Jenkins, Dimond, & Steinberg, 2001)

This pilot study therefore identified the basic knowledge of nursing students related to genetics topic. It was expected that this research can provide new considerations for discourse genetics topic in nursing competencies.

METHODS

This pilot study was quantitative descriptive used cross-sectional approach. It was a replication from a previous study finished by Maradieque, et.al in 2005 (Maradiegue, Edwards, Seibert, Macri, & Sitzer, 2005) Survey of bachelor nursing students was carried out within 3 months at one state school of nursing in Central Java, Indonesia. Approval and ethical clearance was obtained from ethical commission at Faculty of Medicine, Diponegoro University. Furthermore, informed consent was signed by each respondent after study procedure explanation given.

Participation was voluntary. Nursing students were asked to fill up the questionnaire that was adopted and adapted from previous questionnaire; the "Genetics Needs Assessment Survey" was developed by Maradieque, et.al.(Maradiegue et al., 2005) The questionnaire included 59 questions. The questions were divided to three part; 3 items about demographic characteristics, 44 items about knowledge of the various concepts in

genetics, 6 questions about comfortableness in genetics, and 6 items about learning activities in genetics topic.

Gained data were entered and processed using computer. Univariate analysis was performed in this pilot study. The descriptive statistics consist of frequencies and percentages were applied to explain results from data collected.

RESULT

One hundred and seventy respondents were participated in this pilot study. They were freshmen, sophomore, junior, senior, and profession level. The mean age was 19.4 and majority of respondents were female (87.6%). Most of respondents were junior degree (32.4%).

Table 1. Demographic Characteristics (n = 170)

Demographic Characteristics	Category	Frequency	Percentage
Age	Minimum	17	-
	Maximum	24	-
	Average	19.4	-
Gender	Male	21	12.4
	Female	149	87.6
Semester	Freshmen	36	21.2
	Sophomore	51	30.0
	Junior	55	32.4
	Senior	22	12.9
	Profession	6	3.5

This pilot study assessed respondents' knowledge on 44 terms of genetics. Table 2 give detail information on respondents' knowledge about genetics terms.

Table 2. Respondents' Knowledge about Genetics Topics (n = 170)

Genetics topics	Knowledge									
	No knowledge of this topic		Minimal knowledge of this topic		Some knowledge of this topic		High level of knowledge of this topic		Extremely comfortable explaining this topic to others	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Genetic terminology										
DNA: structure and function	2	1.2	64	37.6	93	54.7	11	6.5	0	0.0
RNA: structure and function	6	3.5	66	38.8	88	51.8	10	5.9	0	0.0
DNA replication	8	4.7	73	42.9	80	47.1	7	4.1	2	1.2
Mitosis	4	2.4	50	29.4	102	60.0	9	5.3	5	2.9

Genetics topics	Knowledge									
	No knowledge of this topic		Minimal knowledge of this topic		Some knowledge of this topic		High level of knowledge of this topic		Extremely comfortable explaining this topic to others	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Meiosis	4	2.4	55	32.4	97	57.1	11	6.5	3	1.8
Transcription	16	9.4	63	37.1	78	45.9	9	5.3	4	2.4
Translation	19	11.2	61	35.9	77	45.3	9	5.3	4	2.4
Protein synthesis	4	2.4	58	34.1	94	55.3	11	6.5	3	1.8
Mutation	7	4.1	60	35.3	91	53.5	9	5.3	3	1.8
Autosomal Dominant Inheritance Pattern	30	17.6	66	38.8	63	37.1	9	5.3	2	1.2
Autosomal Recessive Inheritance Pattern	33	19.4	64	37.6	63	37.1	8	4.7	2	1.2
X-linked Inheritance Pattern	57	33.5	61	35.9	45	26.5	5	2.9	2	1.2
Mitochondrial Inheritance Pattern	68	40.0	70	41.2	28	16.5	3	1.8	1	0.6
Genogram	26	15.3	55	32.4	58	34.1	17	10.0	14	8.2
Genetic Condition										
Cystic Fibrosis	85	50.0	62	36.5	20	11.8	2	1.2	1	0.6
Breast cancer/ Ovarii	8	4.7	72	42.4	75	44.1	10	5.9	5	2.9
Colon cancer	18	10.6	87	51.2	55	32.4	8	4.7	2	1.2
Hemochromatosis	94	55.3	65	38.2	10	5.9	1	0.6	0	0.0
Sickle Cell Disease	80	47.1	65	38.2	24	14.1	1	0.6	0	0.0
Thalassemia	27	15.9	84	49.4	54	31.8	4	2.4	1	0.6
Fragile X	82	48.2	51	30.0	33	19.4	0	0.0	4	2.4
Huntingtin's Disease	111	65.3	48	28.2	11	6.5	0	0.0	0	0.0
Familial hypercholesterolemia	115	67.6	45	26.5	10	5.9	0	0.0	0	0.0
Neurofibromatosis	112	65.9	50	29.4	8	4.7	0	0.0	0	0.0
Others										
Polymerase Chain Reaction (PCR)	126	74.1	36	21.2	7	4.1	1	0.6	0	0.0
Trisomy 21 (Down Syndrome)	28	16.5	70	41.2	61	35.9	5	2.9	6	3.5
Trisomy 18 (Edward Syndrome)	56	32.9	61	35.9	46	27.1	6	3.5	1	0.6
Trisomy 13 (Patau Syndrome)	59	34.7	61	35.9	43	25.3	6	3.5	1	0.6
Turner Syndrome	62	36.5	45	26.5	55	32.4	5	2.9	3	1.8
Kleinefelter Syndrome	71	41.8	43	25.3	49	28.8	4	2.4	3	1.8
Osteogenesis Imperfecta	93	54.7	53	31.2	18	10.6	5	2.9	1	0.6

The results of this pilot study indicated that some terms can be interpreted properly by the students, however the others could not applied. It can be stated that some terms were still unfamiliar. Many terms were familiar to students include gene, allele, genotype, phenotype, homozygous, heterozygous, dominant, and recessive. While some unfamiliar terms, for examples locus, missense mutation, nonsense mutation, frameshift mutation, and karyotype.

Figure 1. Respondents' understanding of Genetics Terms (n=170)

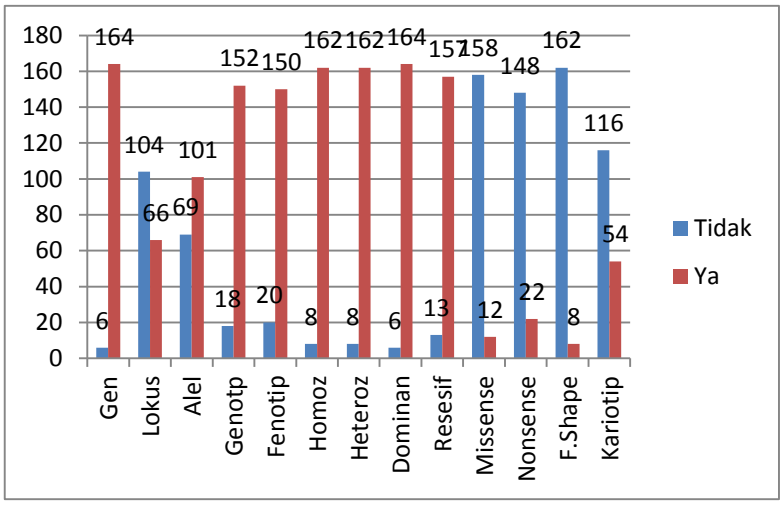
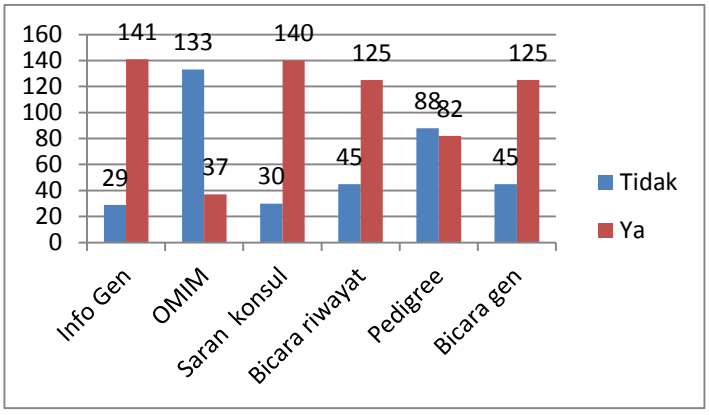


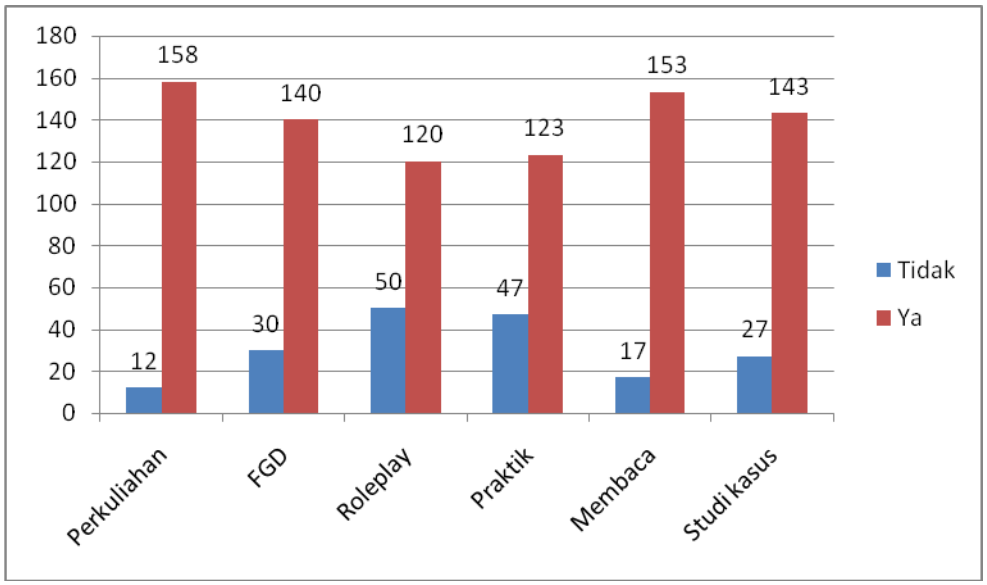
Figure 2 has shown the respondents comfortableness to genetic knowledge. It was seen that 141 from 170 students stated "find genetic diseases information on the internet". Beside that, 140 respondents feel more comfortable when "advise someone to consult about genetic question to appropriate expert". However, the majority of respondenst (133 respondents) expressed discomfort when "using OMIM".

Figure 2. Comfort nursing students related to knowledge of genetics (n = 170)



Education can be implemented in many ways. Figure 3 shown detail of learning methods used in genetics education.

Figure 3. Learning Methods used in Genetics Education (n = 170)



Most of the respondents (158 respondents) stated that class lectures will improve nursing students' understanding of genetics topics. As much as 153 respondents said that reading also can develop their knowledge.

DISCUSSION

Respondents in this study included nursing students at any level of bachelor and profession. It was related to the ratio of male to women students from year to year. Most respondents were female. Based on the School of Nursing data in 2013, from 1999 to now, the number of male students is about 20 % even less. It was in line with the previous study conducted by Dodson that most of respondents (93%) participated were women (Dodson & Lewallen, 2011).

Nursing students' knowledge on genetics topic were still lack. The average of students stated that they only have some knowledge of this topic. This was indicated that genetics topic needs to discuss in the class. A previous study of nursing students' knowledge, perception, and attitudes regarding medical genetics found that most of students have minimal knowledge of medical genetics (Maradiegue et al., 2005). It was also occured in nurses in the clinical settings. Results of previous research demonstrated that nurses' knowledge about genetics Korea were on scale 2.19 (Likert scale 1 to 4) (Kim, 2003). These results can be interpreted that nurses' knowledge about genetics was at the level of "neglected". In line with the results obtained in a previous study conducted that showed that level of knowledge about the genetics nurse well perceived by nurses themselves or directly tested by the researchers showed that low levels of

knowledge (Godino & Skirton, 2012). Based on the phenomenon, it can be seen that the general knowledge of the topic of genetics in nursing students were still lack.

Understanding of the meaning of the terms in the discussion of genetics will assist nursing students in studying genetics further. Most of the respondents did know meaning of some terms asked. In line with the previous study, it was showed that the majority of participants chose the answer "no" or "minimal" know about some terms in genetics, like locus, missense mutation, nonsense mutation, frameshape mutation, and karyotype (Dodson & Lewallen, 2011).

Nurses who already have experience in the clinic were also experiencing the same conditions with associated nursing student to understand the terms in the discussion of genetics. The term pedigree, sex chromosomes, and the basic composition of the cell (Kim, 2003), trisomy 21, and genetic counseling(Hsiao, Lee, Chen, & Lin, 2013) can be well understood by the nurse. While the term dermatoglyphic (Chok, Kwapil, & Scheuermann, 2014) and linkages inheritance were not very familiar among nurses (Kim, 2003).

Nursing students will act some activities associated with the current knowledge of the genetics they feel comfortable with. It included "find information about genetic diseases in the internet", "advise someone to consult about genetics questions to experts", "explore the patients' genetic history of the family", and "discuss with family about appropriate treatment based on genetic considerations". However, there were two activities performed by the students felt uncomforted to genetics knowledge. The first was "using OMIM (Online Mendelian Inheritance in Man)" and "draw individual or a family pedigree". This result were according to previous studies which stated that 22 % of advanced nursing students were able to draw pedigree and 34 % of students comfort to talk about the diagnosis of genetic diseases with the family (Dodson & Lewallen, 2011). According to a one study, drawing pedigree should be cited standardized nomenclature. However, many activities do not cite this specific standards for pedigree (Bennett, French, Resta, & Doyle, 2008).

Various methods of education and learning can be used to improve student comfort related genetic topics. Learning was commonly carried out, among others, in-class lectures, small group discussions, role play, practice using standardized patients, reading, and case study (Maradiegue et al., 2005). In this study, the majority of respondents stated that methods used was appropriate to increase knowledge about genetics. Similar results were also expressed by the lecturers involved in a similar study in New Zealand. The results of these studies mention that the respondents agree with the other forms of learning genetics topics that include lectures, seminars, case studies, practical work, computer-based learning, interactive multimedia and using video (Nicol, 2002).

Other efforts were applied to increase student understanding of genetics topics as an outlined in the following study. The results of this study stated that the method can be implemented by integrating genetics into nursing curricula. Learning strategy can be applied, for example lecture on genetic topics, workshop participation, and conference

on genetics and nursing clinical practice related to genetics (Hsiao et al., 2013; Maradiegue et al., 2005). Integration of genetics into a discussion of the nursing education curriculum for bachelor students were responded positively (Burke & Kirk, 2006; Hetteberg & Prows, 2002; Horner, Abel, Taylor, & Sands, n.d.; Maradiegue et al., 2005; Williams et al., 2011). Discussion of genetics that can be integrated into the curriculum of basic nursing education has been delivered by Jenkins in 2001. It included: (1) indications for genetic referral, (2) basic knowledge about human genetics, (3) genetics in humans and applications to current practice, (4) social issues and ethics of genetics, (5) identify appropriate sources, (6) psychological impact on genetic disorder, (7) evaluation of genetics and counseling, (8) genetics relevant in practice, (9) awareness of the methods of the new genetics, (10) differences ethnic-cultural differences, and (11) self-awareness of the values and attitudes (Jean F. Jenkins et al., 2001).

In a one study that finished by Nicol stated that genetics topic would not be enough integrated to learning session if less than 10-20 hours (Nicol, 2002). Beside that, one study also recommended that for further nursing education is needed appropriate management to include genetics topic discussion about family history and genetic information (Bankhead et al., 2001). Furthermore, the Genomic Nursing State of Science Advisory Panel has been arised the genomic nursing science blueprint that provides the framework to improve integration of genetics and genomics into nursing curricula (Calzone et al., 2013; De Sevo, 2013).

CONCLUSION

The study produced several conclusions that can be described as follows: Students of nursing is dominated by women students than men. Knowledge of nursing students on the topic of genetics can be said to be still lacking. Many terms in genetics is a term that is not familiar to nursing students. Nursing students feel comfortable using the internet and talking with family issues related to genetics, but are not comfortable in using OMIM and draw pedigree. A variety of learning methods can be used to increase knowledge about the topic of genetics nursing students.

Nursing education institutions should be include a discussion of the genetics of nursing curriculum. Discussion of genetics in the nursing curriculum can be placed in a teaching subject alone or integrated in existing teaching subject. It is also recommeded that need to increase genetics learning hours to a minimum of 50 hours per semester.

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