

Nursing Educational Guidelines to Enhance Competency- Based Practice among Nurses as Genetic Counselors

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Abstract

Background: The present study aimed to evaluate the efficacy of nursing educational guidelines to enhance competency-based practice among nurses as genetic counselors. **Research design:** A quasi-experimental design was used. **Setting:** data were collected from the oncology and outpatient departments at Benha university Hospital, Qaluobia governorate, Egypt. **Subjects:** Convenient sample of all available nurses (50) who were working in the oncology and outpatient departments during the data collection period. **Tools of data collection:** Three tools were utilized to collect data. 1) Structured questionnaires composed of 2 parts: Demographic characteristics and Nurse's Knowledge regarding basics of genetics and genomic, 2) Nurses' attitude toward genetic counseling. 3) Check list to assess competency-based practice among nurses as genetic counselors. **Results:** 20% of the studied nurses had satisfactory level of knowledge pre educational guidelines which changed to 94% post guidelines ($P < 0.05$). There were marked improvement in all items of nurses' competency-based practice post educational guidelines with highly statistical difference ($P = 0.000$). There were 56% of the studied nurses had positive attitude towards importance of genetic counseling post guidelines implementation compared to 14% pre guidelines implementation ($P < 0.05$). **Conclusion:** the nursing educational guidelines had significant efficacy on improving the studied nurses' knowledge, practice and attitude regarding basics of genetics and genomic. **Recommendations:** Incorporate the genetic course into the nursing curriculum and conduct continuous educational interventions to improve the competencies in genetics and genomics among nurses with different degrees and areas of practice.

Keywords: Educational Guidelines, Competency- Based Practice, Genetic Counselors.

Introduction

Advancements in genomic sciences turned the focus of health care from the diagnosis and treatment of genetic diseases to genetic risk identification, genetic counseling and protective actions. In the field of medicine, genetics is defined "science of human biological variation as it relates to health and disease" and it includes understanding the pathogenesis and etiology of diseases that are known to be genetic in origin. Over the last decade, there was a massive increase in the amount of research about genetics. Hence, this led to an

increase in the number of diseases discovered, along with that genetic testing evolved and has become a part of many screening programs (Sindi et al., 2017).

'Genetic counselor' is an internationally recognized professional title with practitioners having specialist education, assessed competencies in genetics (and now genomics) combined with counseling skills. Definitions of genetic counseling have evolved over time, however professionals trained in genetic counseling traditionally have assessed an individual's risk of a genetic disorder, prepared

individuals for genetic testing, communicated the results and assisted the management of the patients' genetic disease as well as preparing and supporting the individual to contact their relatives also at risk of the same disease (**Patch et al., 2018**). While genetics is the study of individual genes, genomics is the study of an organism's entire set of genes (genome) and the interaction of the genome with the environment (**Buchman et al., 2020**).

In modern health-care system, it is expected that health-care professionals are highly efficient and capable of understanding and translating findings from genetic screening and testing into a language that is easily understood by the common public. However, the complexity of genetics dictates the need for specialized training to decipher the genetic information, also compel a fundamental restructuring of the way training or education on genetics is provided to the health-care professionals. Therefore, recognition of genomics as a central science for health professional knowledge is essential (**Aga et al., 2021**).

Previous studies regarding the knowledge and competences of nurses regarding genetic counseling revealed that there is a lack of knowledge of human genetics among many primary health nurses (**Birks et al., 2015**) in the same line **Sasaki et al., (2015)** reported that the nurses do not have enough knowledge about genetics, nor do they have the time to prepare for genetics-related services that are in potential demand in the community. The link between the genetic information and nursing care was not established. Even nurses caring for the symptoms of hereditary disorders find it difficult to correlate care with genetic information.

Significance of the study

A new scientific paper published in the European Journal of Human Genetics has confirmed that the number of people worldwide living with a rare disease is estimated at 300 million (**Cam, 2019**). The nurses should have the knowledge and skills to cover the patients who would attend genetic services either to

obtain a diagnosis of a genetic condition or because they knew of a condition in their family and need to understand their own options and choices for managing the consequences of the condition. It is not surprising that there is a gap between genetic information and duties of primary health nurses, which are non-direct care duties that they had been educated on before the rapid development of genetics (**Molster et al., 2018**).

Aim of the study:

To Evaluate the Efficacy of Nursing Educational Guidelines to Enhance the Competency -Based Practice among Nurses as Genetic Counselors

Research hypotheses

1.The total scores of the studied nurses' knowledge regarding basics of genetics and genomic post educational guidelines is higher than their score pre educational guidelines

2.The total scores of studied nurses' Competency -Based Practice as genetic counselors post educational guidelines is higher than their score pre educational guidelines

3.The studied nurses' attitude toward genetic counseling post educational guidelines is higher than pre educational guidelines.

Operational definition

Competency- Based Practice in the current study means applying genetics and genomic knowledge, attitude, and practice to achieve competence through development of guidelines to enhance nurses' practice as genetic counselors.

Subjects and Methods

Research design

A quasi-experimental design (pre/post-test) was utilized to achieve the aim of the current study.

Study setting: data were collected from the oncology and outpatient departments, at Benha university Hospital.

Study subjects: Convenient sample of all available nurses (50) who were working in the oncology and outpatient departments during the data collection period and agreed to participate in the study.

Tools of data collection

Three tools were designed to collect data.

Tool (I): Structured questionnaires composed of 2 parts

Part I: Demographic characteristics of the studied nurses: age, gender, experience and work position.

Part (II): Nurse's Knowledge regarding basics of genetics and genomic

It was developed by the researchers based on the literature review (**Allied health professionals Australia, 2023 ; CDC, 2022**), it was consisted of (32) questions to cover 3 major items as following, Basic concepts of genetics and genomic (10 questions about gene, genomic, number of human genes, function, genetic testing , genetic inheritance, DNA ...etc) Genetic disorders (12 questions about definition, types of genetic disorders, mechanism of occurrence, examples of genetic diseases, strategies of early detection and management) and genetic counseling (10 questions about definition, objectives, components, steps, principles, types, ethical consideration and role of nurse)

Scoring system:

Multiple choice questions were scored as "1" for correct, and "zero" for incorrect, so the total scores were 32. The total scores are summed and converted to percentage then divided to two categories, unsatisfactory (<70%), and satisfactory if $\geq 70\%$.

Tool (II) Nurses' Attitude Toward Genetic Counseling (NATGC)

The eight-item ATNGQ was used to assess the nurses' attitude toward genetic counseling (**Munroe, 2014**). The nurses gave their responses on a Likert scale, where 0 =

disagree, 1 = unsure, and 2 = agree. The total scale scores were calculated to give the overall attitude scores. The total scores are summed and converted to percentage then divided to three categories, unsatisfactory (<50%), average (50 - 74%) and satisfactory if $\geq 75\%$.

Tool (III) Check list to assess competencies -based practice for nurses as genetic counselors

It was developed by the researchers based on the literature review (**European board of medical genetics, 2010**), it was consisted of (34) steps to cover 7 sections as following: construct relevant, targeted and comprehensive personal and family histories and pedigrees (5 steps), Establish a mutually agreed upon genetic counseling agenda with the client (4), Employ active listening and interviewing skills (3), Apply genetic counseling skills in a culturally responsive and respectful manner to all clients (4), Promote client-centered, decision-making (5), Effectively educate clients about a wide range of genetics and genomics information based on their needs, their characteristics and the circumstances of the encounter (8) and finally Act in accordance with the ethical, legal and philosophical principles and values of the genetic counseling profession (5).

Scoring system

The steps were scored as 1 for not done, 2 for correct but incompletely done and 3 for correctly and completely done. All scores were summed and converted to mean and standard deviation to be used statistically to test the impact on the intervention

Validity:

A panel of five Faculty members of medical surgical nursing and community health nursing departments reviewed the previous tools.

Reliability

The reliability of the structured interview to assess the total level of knowledge was assessed in the present study and the Cronbach's alpha coefficient was 0.78.

Additionally the reliability of the competency check list was 0.72

Approval:

Official permission was acquired from the appropriate officials at Faculty of Nursing and Benha University hospital to perform the research and gather the necessary data; they were provided with the research's purpose, objectives, and advantages and the tools used to collect the study results.

Ethical considerations:

Permission taken from the research ethical committee at Benha Faculty of Nursing and the study was conducted with careful attention to the ethical standards of research and the rights of participants. Oral consent was taken from each nurse; they were informed that the data collected will be used for the research only. They were assured about confidentiality and informed that they could withdraw at any time from the study.

Pilot Study

A pilot study was conducted on ten nurses to assess the content of the data collection methods, detect any need for modifications and estimate the time required for data collection. Participants in the pilot study were excluded from the studied sample.

Field work

The process of data collection was performed over a period of six months during morning and afternoon shifts, from beginning of March, 2022 to the end of August, 2022 ; data were collected by interviewing nurses in the oncology and outpatient departments at Benha university Hospital and achieved through pre-test: before implementing nursing educational guidelines to have baseline assessment about nurses' level of knowledge, attitude and practice using tools of data collection (tool I, II and III). Post-test: immediately after implementation of nursing guidelines (knowledge, attitude & practice) using the same tools of data.

Data collection was conducted on the following phases:

Assessment phase:

❖ The researchers met nurses for the first time and explained the aim, objectives and procedures of the study to get their acceptance to participate. Total number of the studied nurses was 50 nurses; they were divided into small groups ranged from 2 to 3 nurses for each group to avoid making problems to the working process.

❖ Pretest data was collected; the researcher assessed the nurses' knowledge regarding basics of genetics and genomic by using Tool I, the time required for completion of the questionnaire was ranged from 20-25 minutes.

❖ The researcher assessed the nurses' attitude toward genetic counseling, using Tool II, the time taken was 15 to 20 minutes.

❖ The nurses' competence-based practice was assessed by using Tool III, and the time of this session ranged from 30 to 35 minutes.

Planning phase

❖ The researchers reviewed the literature and designed the nursing educational guidelines and the clinical scenarios according to the needs of nurses and the results of the pretest.

❖ Teaching materials were prepared e.g. booklet, posters and video that helped in covering theoretical and practical information.

Implementation phase

❖ The nursing educational guidelines was conducted according to tailored schedule for at least 3 sessions each session ranged between 20- 30 minutes during their time of break.

❖ Each session was started with a summary about the previous session then the objectives of the new one and given the nurses enough time for discussion with explanation any doubt.

❖ **Session one:** (introductory session) it included orientation and explanation of reasons and importance of designed nursing guidelines

and gave an explanation about genes, genetic disorders and diseases and its prevalence.

❖ **Session two:** included providing an explanation about genetic counseling and skills that required to implement.

❖ **Session three:** included providing clinical scenarios according cases' needs to genetic counseling and using the role play strategy to train the nurses to conduct the genetic counseling.

Evaluation phase

❖ At the end of intervention period post-test was performed to evaluate the efficacy of the nursing educational guidelines by using the same tools of assessment phase. The nurses' level of knowledge and attitude were evaluated and their competency based practice was measured either by real cases or role play strategy because limited cases who accept the genetic counseling.

Statistical analysis:

The collected data will be organized, revised, stored, tabulated, and analyzed using the number, percentage distribution, mean and standard deviations were calculated. Proper statistical tests were used (chi-square, T-test and Pearson correlation coefficient) to determine whether there were significant differences or not by using the statistical package for the social science program (SPSS) version 20. Statistical significance was considered at p -value < 0.05 .

Statistical significance was considered as the following: -

- P value < 0.001 highly statistically significant relation
- P value < 0.05 statistically significant relation
- P value > 0.05 no statistically significant relation

Results

Table (1) shows demographic characteristics among studied nurses, where

50.0% were aged ≥ 40 years old, with a mean age of 39.30 ± 0.78 . Regarding gender, 90.0% of them were female and 94.0% were working as a clinical nurses, and 52% had experience ranged from 10- <20 years. Moreover 98.0% didn't attend course/ event about genetics /Genomics.

Figure (1) Illustrate barriers to include genetic counseling at nurses' routine daily duties which illustrated that negative culture of the clients was the main barrier reported by the nurses, followed by lack of training courses. Lack of time and finally reported that it is not important with a percentage of 90%, 70%, 66% and 64% respectively.

Table (2): Shows difference between studied nurses' knowledge regarding basics concepts of genetics and genomic, Genetic disorders and genetic counseling which was significant post implementing nursing educational guidelines, where 22% had satisfactory level of knowledge pre guidelines to be 74.0% post guidelines, with 18.0%, 14.0 %, respectively had satisfactory knowledge pre guidelines regarding Genetic disorders, Genetic counseling which changed to 72.0%, 66.0% respectively at post Figure (2): Showed that 56% of the studied nurses had positive attitude towards importance of genetic counseling post guidelines implementation compared to 14% had positive attitude pre guidelines implementation.

Table (3): Illustrate that, there were marked improvement in all items of nurses' competencies -based practice post educational guidelines with highly statistical difference ($P= 0.000$) between pre and post nursing educational guidelines.

The table clarifies the correlation between nurses' knowledge & attitude with the total practice regarding genetics counseling. Showing that there was a positive not significant correlation during pre-guidelines period, while a positive significant correlation during immediate with p value at (0.008^* & 0.0001^* , respectively).

Table 1. Distribution of studied nurses according to their demographic and nursing characteristics (n= 50).

Demographic characteristics	(No.)	%
Age		
- 23-<30	10	20.0
- 30- < 40	15	30.0
- ≥40	25	50.0
Mean ± SD	39.30 ± 0.78	
Gender		
-Male	5	10.0
-Female	45	90.0
Work position		
-Clinical nurse	47	94.0
-Nursing supervisor	2	4.0
-Head nurse	1	2.0
Years of experience		
- 1-< 5 years	8	16.0
- 5-< 10 years	16	32.0
- 10- < 20 years	26	52.0
Mean ± SD	9.36 ± 0.74	
Attended course/ event about genetics /Genomics		
- Yes	1	2.0
- No	49	98.0

Figure (1) frequency distribution of studied sample regarding barriers to include genetic counseling at their routine daily duties

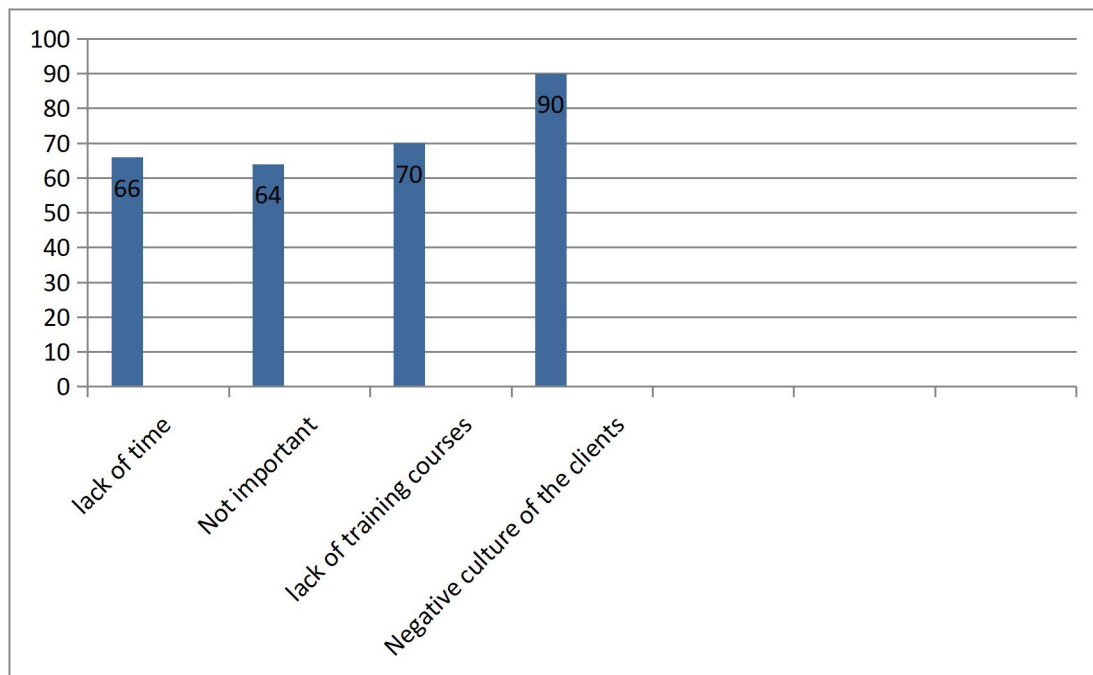


Table (2): Difference between studied nurses' knowledge regarding basic concepts of genetics and genomic, Genetic disorders and genetic counseling at pre and post nursing educational guidelines (N=50).

Items		pre		Post		X ²	P
		N	%	N	%		
Basic concepts of genetics and genomic	Satisfactory	11	22.0	37	74.0	4.955	0.026*
	Un satisfactory	39	78.0	13	26.0		
Genetic disorders	Satisfactory	9	18.0	36	72.0	4.268	0.039*
	Un satisfactory	41	82.0	14	28.0		
Genetic counseling	Satisfactory	7	14.0	33	66.0	4.193	0.041*
	Un satisfactory	43	86.0	17	34.0		
Total	Satisfactory	10	20.0	47	94.0	4.344	0.037*
	Un satisfactory	40	80.0	3	6.0		

Figure (2): Difference between studied nurses' Attitudes towards importance of genetic counseling at pre and post nursing educational guidelines (N=50)

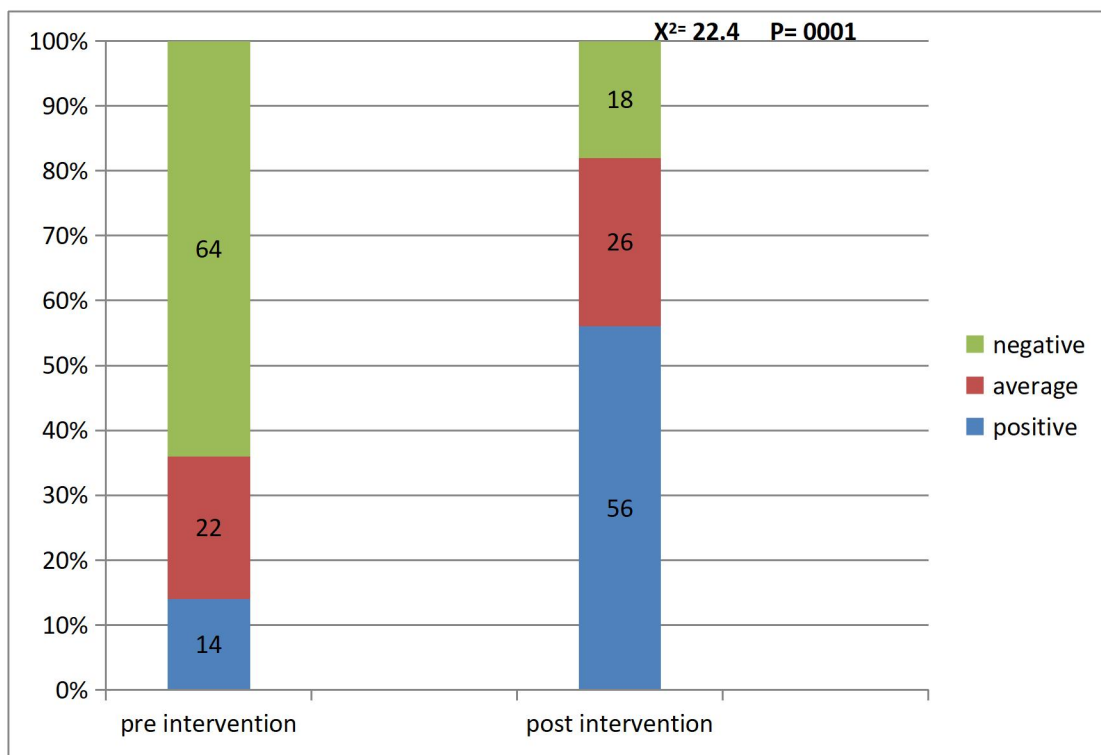


Table (3): Difference between studied nurses' competencies based - practice for nurses as genetic counselors at pre and post test. (N=50)

Competencies for nurses as genetic counselors/ (total score)	Range/Mean	Pre	Post	T	P
Construct relevant, targeted and comprehensive personal and family histories and pedigrees. (15)	Range	7-10	9-13	63.1	0.0001
	Mean±	8.2±0.9	11.6±1.3		
Establish a mutually agreed upon genetic counseling agenda with the client. (12)	Range	6-9	8-12	49.3	0.0001
	Mean±	7.9±0.9	10.03±1.1		
Employ active listening and interviewing skills to identify, assess, and empathically respond to stated and emerging concerns.(9)	Range	4-6	7-9	53.4	0.0001
	Mean±	4.7±0.7	7.2±0.9		
. Apply genetic counseling skills in a culturally responsive and respectful manner to all clients. (12)	Range	4-7	6-11	67.2	0.0001
	Mean±	5.1±1.1	9.2±1.3		
Promote client-centered, decision-making. (15)	Range	5-8	11-14	71.6	0.0001
	Mean±	6.3±0.8	12.3±1.1		
Effectively educate clients about a wide range of genetics and genomics information based on their needs, their characteristics and the circumstances of the encounter. (24)	Range	9-13	17-22	64.3	0.0001
	Mean±	11.4±1.2	19.4±1.7		
Act in accordance with the ethical, legal and philosophical principles and values of the genetic counseling profession (15)	Range	7-12	9-13	49.1	0.0001
	Mean±	8.8±1.6	11.3±0.7		

Table (4) Correlation coefficient between the nurses' total knowledge and their practice regarding genetics counseling pre and post nursing guidelines (n=50).

Variables	Study period	Practice	
		p-value	r- test
Knowledge	Pre	<i>0.115</i>	<i>0.226</i>
	Post	<i>0.008*</i>	<i>0.374</i>
Attitude	Pre	<i>0.32</i>	<i>0.214</i>
	post	<i>0.0001*</i>	<i>0.462</i>

Discussion

Nurses play a pivotal role in providing health care, and they should be well equipped to apply genetics and genomics to health care settings so there is an urgent need for educational guidelines to improve nurses' competencies, including knowledge, attitudes, and practice in genetics and genomics. Based on what was mentioned in the previous lines the current study aimed to evaluate the efficacy of nursing educational guidelines to enhance competency-based practice among nurses as genetic counselors. The results of the current

study illustrated that half of the studied nurses were aged ≥ 40 years old, with a mean age of 39.30 ± 0.78 and had from ten to less than twenty years of experience, the majority were females worked as clinical nurses; most of them didn't attend courses or events about genetics and Genomics.

Other study by **Danielle and Memnun (2022)**, about assessing nurse practitioner practices regarding genetics and genomics in healthcare services in the United States, revealed that the mean age of nurses was 49.7 ± 12.7 years old and the mean years of practicing

as a practitioner nurse were 23.3 ± 13.8 years and the majority were females, also, study results by **Mohamed and Mokhtar (2019)** showed, the majority of the studied nurses in outpatient clinics were males, their age range between thirty to forty years old and had sixteen to twenty years of experiences.

The results of the current study illustrated that negative culture of the clients was the main barrier to apply the genetic counseling reported by the nurses, followed by the lack of training courses, lack of time and finally reported that it is not important. The current study was supported by **Pichini and Bishop (2022)** who stated the challenges to apply genetic counseling at health setting were including lack of time and resources for appropriate training to enhance knowledge and skills of the healthcare practitioners. In the same line **Couns, Jacobs and Phillips (2020)** reported that the barriers of integrating genetic and genomic into practice were limitations to genetics knowledge and skill, low confidence initiating genetics discussions, lack of resources and guidelines. In the same line **Guillory (2022)** mentioned that the negative attitude, low of knowledge, lack of skills and lack of time are the major barriers to implement genetic counseling.

The results of the current study showed that the majority of the studied nurses had unsatisfactory knowledge related to basics concepts of genetics and genomic, Genetic disorders and genetic counseling, before the educational guidelines while the result of the study showed improvement in the studied nurses' knowledge post educational guidelines with statistically significant differences between pre and post. The current study was supported by **Rodriguez (2022)** who reported that the knowledge of nurses were improved after implementing the educational intervention. Similarly **Guillory (2022)** reported that eighty-four percent of nurses answered incorrectly and recommended training courses to improve their levels of knowledge and skills regarding genetics.

The current study showed that majority of the studied nurses had negative attitude towards importance of genetic counseling. In

the same line **Nagy et al., (2019)** reported a gap in the knowledge and attitude of Egyptian healthcare workers about genetic health services. On the other hand **Rahma et al., (2020)** reported that most of studied nurses had positive attitude about genetic testing and providing genetic counseling for patients. The differences may be due to the genetics course was not included in the undergraduate study at most of Egyptian faculty of nursing

Additional the current study revealed that the education guide lines had significant efficacy to improve the attitude of the studied nurses. These was in harmony with **Patel and Parmar, (2022)** which their findings reported that nurse led intervention is effective in improvement of knowledge and change the unfavorable attitude in to favorable attitude. In the same line **Kawasaki et al., (2021)** reported that the education program helps public health nurses be positively involved in human genetic disorders

The results of the current study stated that the educational guidelines had significant efficacy on raising the mean score of studied nurses regarding all competencies under the study where p is <0.05 . These results were consistent with **Talwar et al., (2017)** who conducted a systematic literature review about the effect of genetic education on improving the competencies of health care providers. They reported that nearly all studies reported participants' improvements in one or more of the following areas: knowledge, attitudes, skills, intention, self-efficacy, comfort level, and practice. In the same line **Houwink et al., (2015)** reported that the educational program achieved sustained improvement of oncogenetic knowledge and consultation skills. on the other hand **Zureigat Gould and Seven (2022)** reported that only limited research shows that educational interventions improved the competencies in genetics and genomics among nurses with different degrees and areas of practice. The difference regarding the results of the current study and the study of Zureigat Gould and Seven (2022) may be due to the most of researches that included in their study used different types of interventions, including online/remote education, and written materials

In contrast, this study used face to face education.

The results if the current study revealed that there were significant correlation between the total level of nurses' knowledge and attitude with their competencies after implementing the educational guidelines. These results were in harmony with **Talwar et al., 2017; Slade, Subramanian& Burton (2016)** who reported that the total level of knowledge and attitude of health care providers about genetic and genomics significantly influence their skills.

Conclusion

The result of the study showed that the nursing educational guidelines effectively improved the studied nurses' knowledge regarding basics of genetics and genomic and had significant efficacy to improve the attitude of the studied nurses toward genetic counseling. Additionally the educational guidelines had significant efficacy on raising the mean score of the studied nurses' competencies-based practice and there were significant correlation between the total level of nurses' knowledge and attitude with their competencies after implementing the educational guidelines

Recommendation

1.Incorporate the genetic course into the nursing curriculum,

2.Conduct continuous educational interventions to improve the competencies in genetics and genomics among nurses with different degrees and areas of practice.

3.Develop appropriate policies and regulatory frameworks to facilitate the implementation of genetic counseling at health care setting.

4.Further researches needed to enhance nurses' performance regarding genetic counseling.

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