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Effect of aGuideline Module on DevelopingPediatric Nurses Core Competencies InConducting Genetic Counseling

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Abstract: *As science advances, new competencies must be integrated into nursing practice. Pediatric nurses are expected to have the necessary knowledge to interpret genetics and genetic counseling information into nursing care. Therefore, the aim of this study was to evaluate the effect of a guideline module on developing pediatric nurses' core competencies in conducting genetic counseling. This study was conducted at Pediatrics Department of El Menoufia University Hospital and MCH centers of Shebin El-Kom city. The study sample was composed of sixty nurses. A quasi-experimental design was used. Structured interview questionnaire schedule was used for data collection.The results of this study showed that the majority of nurses who attended the sessions of guideline module had good knowledge on posttest and follow-up test compared to all of them had poor knowledge on the pretest. Therefore, it was concluded that on posttest pediatric nurses in selected settings had an adequate level of knowledge and skills about genetics contents and genetic counseling after implementing a standardized guideline module than on pretest. So, it was recommended that nurses need to be supported in their career development for increasing the diffusion of new ideas related to genetic and genomic healthcare into clinical practices and education.*

Key Words:*Pediatric nurses, CoreCompetencies, Genetic, Genetic counseling.*

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I. Introduction

Genetics, in general, is a rapidly expanding and diversifying field. The twentieth century was a time of intense work and discovery of human hereditary diseases [1]. Genetic testing and counseling are relatively newconcepts and their expansion has been greatly aided by the advent of the human genome project.According to the national institute of health [2], the genetic basis of approximately 1800 genes has been discovered and there are over 2000 genetic tests available. With a greater wealth of knowledge available, a need for professionals toadminister, explain and counsel patients and families is necessary, these done through genetic conditions/testing became apparent as well [3].An estimated 303000 newborn dies within 4 weeks of birth every year worldwide due to congenital anomalies [4]. Many studies indicated that genetics are responsible for congenital anomalies in 2–3% of all live births. It accounts for 15% –30% of all pediatric hospitalizations and causes higher health care costs [5]. According to [6], he mentioned that the Arab region is characterized by high level of consanguinity rates in the range of 25-60%. Also, certain disorders were common throughout the Arab world including hemoglobinopathies, congenital malformations, and several metabolic disorders.In Egypt, [7] mentioned that the hereditary disorders and congenital anomalies were rapidly becoming a major public health concern. The prevalence of congenital and genetic disorders among infants and young children in Egypt ranged from 2.8% in urban areas to 8.4% in rural areas in Upper Egypt. Also, [8] identified that consanguinity in Egypt increased the prevalence of rare genetic congenital anomalies and nearly doubled the risk for neonatal and childhood death.Nurses are expected to have a genetic and genomic knowledge that can be integrated into clinical practice [9]. This expectation is more than 50 years old, yet researchers today are finding nurses are still not competent or comfortable in the clinical applications of genetics and genomics [10]. However, [11] added that in order to integrate that information into clinical practice, they had to guidelines of the human genome project. All nurses, regardless of country or practice setting, needed to be appropriately trained in genetics in order to provide best practices for prevention, recognition and/or treatment of diseases [12]. According to [13] all nurses in practice settings must have a role in the delivery of genetics services to vulnerable populations. Basically, nurses should advocate vulnerable client by facilitating their access to genetic resources; and providing or reinforcing information about a genetic condition/concern. [14]emphasized that there was a need for a common minimum standard of competency in genetics, and that core competency was used as a basis for health professional education in many fields and settings. Also, [15] emphasized that all nurses required genetic knowledge to identify, refer, support, and care for persons affected by or at risk for genetic conditions. The

clinical application of genetic and genomic knowledge had major implications for the entire nursing profession. However, researches that were related to nurses' knowledge and practice in this field in Egypt were lacking.All nurses needed to be able to understand the language of genetics in order to communicate with the others.They should be able to interview clients and take an accurate history over three generations, recognize the possibility of genetic disorders in individuals or families, and appropriately refer that person or family for genetic counseling. They should also be prepared to explain and interpret correctly the purpose, implication, and results of genetic tests [16]. Above all, many studies reported that nurses had poor knowledge about genetic information. [17] and[18] indicated that nurses had a shortage of knowledge in relation to basic genetic information, genetic diseases and genetic counseling. Therefore , this study aims to assess the pediatric nurses' knowledge and skills in conducting genetic counseling, design and implement a standardized guideline module based on the actual assessment findings to develop nurses' knowledge and skills in conducting genetic counseling and evaluate the outcome of the guideline module on nurse s' knowledge and skills in conducting genetic counseling.

II. Aim Of The Study

The aim of this study was to evaluate the effect of a guideline module on developing pediatric nurses core competencies in conducting genetic counseling.

III. Objectives of This Study Were To

1) Assess pediatric nurses' knowledge and skills in conducting genetic counseling.
2) Design and implement a standardized guideline module based on the actual assessment findings to develop nurses' knowledge and skills in conducting genetic counseling.
3) Evaluate the outcome of the guideline module on nurses'knowledge and skills in conducting genetic counseling.

IV. Research Hypothesis

1) Pediatric nurses in selected settings have inadequate knowledge and skills for conducting genetic counseling
2) Pediatric nurses in selected settings will have adequate knowledge and skills for conducting genetic counselingafter implementing a standardized guideline module.

V. Theoretical and Operational Definitions

V.1.Guideline Module

It is defined by [19] as a recommended practice that allows some discretion in its implementation or use.In this study, it indicates the standardized knowledge and practice indicators that provide a guide to nurses of essential knowledgeelements and suggested practice competencies about Geneticsand genetic counseling information according to [9].

V.2.Core Competency

It is defined by [20] as an observable, measurable, a performance-based outcome that indicates the achievement of a particular knowledge component, application, or demonstration of a psychomotor behavior or skill. In this study, it is an assessment of nurses' application of genetic and genetic counseling, identification, referral and provision of care and support. These competencies were assessed by [14] in her study about the development of core competencies to support preparation of health professionals in Europe.

V.3.Genetic counseling

[21]defined it as a communication process that deals with the human problems associated with the occurrence, or risk of occurrence, of a genetic disorder in a family.In this study, genetic counseling includes obtaining personal and family health history, identify the genetic problem, referral andprovision of care, as well as support and follow up.

VI. Subject and Method

6.1. Research Design: A quasi-experimental design was utilized for this study (pre and post-test)**6. Settings**

This study was conducted at Pediatrics department of El Menoufia
University Hospital and MCH centers of Shebin El-Kom city (MCH
Kably and MCH Bahary).These settings were selected because allnurses were giving care to children and their families.

6.3. Subjects
A convenient sample of nurses was selected.The total number of nurses who shared in this study were 60 nurses, 36 of them from ShebinElkom, Menoufia University Hospital and 24 were from MCH centers of Shebin El-Kom city (10 nurses MCH Kably) and (14 nurses MCH Bahary).

6.3.1.Criteria for sample selection
The only criteria for sample selection were that all selected nurses must be engaged in child care through any phase of childhood life.

6.4. I**nstrument**:-one instrument was utilized for this study:-**Structured interview questionnaire schedule**. It was designed by the researchers after reviewing related literature. It includes five parts:

Part one: Characteristics of studied nurses. It was designed to collect data about characteristics of nurses. It contained data such as age, job, educational levels, and place of current work and years of experience.

Part two: knowledge of nurses about geneticsThis tool was developed by [18] and modified by the researchers after a review of the literature. It contained the definition of the cell, chromosome, gene, mode of transmission of hereditary diseases, resources of genetic counseling information etc.

Part three: knowledge about genetic diseases. It was used to assess nurse's knowledge about genetic diseases. It contained questions about Down syndrome, RH factor, sickle cell anemia, etc.

Part four:- knowledge about genetic counseling. it was used to assess nurse's role in providing genetic counseling. It was developed by [18] and modified by the researchers after a review of the literature. It contained data about the determination of carriers of genetic disorders, counseling parents of children with genetic disorders, making a referral to parents of children or couples with possible hereditary diseases to genetic advice centers, etc.

6.4.1.Scoring system: Each item was scored as follows:-

Scoring items	**Score**	Total knowledge score
Complete	2	Poor knowledge < 60 %
Incomplete	1	Good knowledge ≥ 60%
Don't know	0	

6.5.Procedures
6.5.1.Ethical consideration
An oral consent was obtained from nurses for acceptance to share in this study. They were informed about the privacy and confidentiality of information obtained from them and that they had the right to withdraw at any time.

6.5.2. An official permission
It was obtained for data collection was obtained from the administrators of El Menoufia University Hospital and MCH centers of Shebin El-Kom city (MCH Kably and MCH Bahary) after submitting official letters from the Dean of the Faculty ofNursing at El Menoufia University explaining the purpose of the study, outcomes, and the method of data collection.

6.5.3.Tool development
Tool developed by the researchers for data collection after a review of the past and current literature, local and international related literature including books, articles, periodicals, and magazines was done to be acquainted with the various aspects of the problem and to design the data collection tool.

6.5.4. For validity assurance purposes
the tool was submitted to a jury of two pediatric nursing experts and one pediatrician. Accordinglymodifications of the tool were done to promote the appropriateness of content and sequence of items.

6.5.5. Reliability of the tool
Reliability test was done by applying the structured interview questionnairescheduleon 6 nurses using test-retest technique and Pearson Coefficient factor was 90.8%. The tool was applied to them and retested after 2 weeks .This method was used to measure the homogeneity of the tool.

6.5.6. A pilot study
It was carried out at the above-mentioned settings on six nurses(10%) to assess the clarity, convenience, and consistency of the study tool and the time needed to fill it. Clarification and some modifications of some items were done. Therefore, the pilot study sample was excluded from the total sample.

6.5.7**.** Data collection was started from May 2014 and lasted until March 2015. Data was collected five days/week (Saturday, Sunday, Monday, Tuesday, Wednesday).

6.5.8. Before data collection, nurses were provided with instruction about how to fill data collection tool. Afterwards, a structured interview questionnaire schedule used for assessing nurses' knowledge about genetics and genetic counseling. It took about 30 –50 minutes for nurses to fill data collection tool.

6.6. Guide Line module
Accordingly, areas of weaknesses in nurses' knowledge and skills were identified and guideline module was developed.

6.7.Objectives of the guideline module were set according to needs of nurses and reviewing of related literature. The content of module was planned to be provided to nurses in groups or individually about basic knowledge and skills related to genetics and genetic counseling.
6.8. A booklet about basic knowledge and skills of genetics, genetic counseling was prepared and provided to nurses.
6.9. In El-Menoufia university hospital, nurses were divided into small groups. Each group had its own time schedule. The time schedule was planned with nurses. Each nurse selected her most appropriate time. Each group contained between 2-5 nurses.
6.10. Each group received three sessions of basic knowledge and skills of genetics and genetic counseling. Each session lasted between one to two hours. An explanation of nursing guideline module was provided inside the unit in the nurses' office. Direct reinforcement in the form of material rewards as well as affection and encouragement were provided as positive feedbacks.
6.11. The Booklet about genetics and genetic counseling was distributed among nurses in the first session.
6.12. A post-test was done immediately after implementing the module for assessing nurses' knowledge and skills about genetics and genetic counseling. Then, the follow-up test was done about genetics and genetic counseling three months later.

VII. Data Analysis

Data was coded and transformed into specially designed form to be suitable for computer data entry process. The data collected were tabulated and analyzed by SPSS statistical package version 16 on IBM. Quantitative data were expressed in the form of mean and standard deviation (× ±SD) and analyzed by applying student t-test, Mann-Whitney test, Chi-Square ($\chi 2$) and Fisher's exact test for comparison of normally distributed variables. Qualitative data were expressed as number and percentage. Level of significance was set at P-value<0.05.

VIII. Results

Table 1 illustrated characteristics of studied nurses. As indicated more than half of nurses (60.0%) were from Menoufia University Hospital. They were working at pediatrics departments (58.3%). Meanwhile, 40.0% were from MCH Bahary and MCH Kebly 23.3% and 16.7% (consequently).Also, the same table revealed that the majority of nurses had a nursing diploma (35.0%) and their mean and standard deviation of age and years of experience were (31.2± 9.1) and (11.9 ± 9.3) respectively.
Figure 1 illustrated nurses' years of experience. The figure showed that majority of them had either 5-10 years or less than 5 years of experiences.
Table 2 represented basic knowledge of nurses about genetics on pre, post and follow up tests. The findings illustrated that more than half of nurses had knowledge on posttest about the cell, chromosome, gene and meioses (96.7%, 71.7%, 54.3% and 50.0% respectively) compared to none on the pretest. For this reason, there were statistically significant differences between nurses at1% level of statistical significance. Also this table revealed that about more of less than half of nurses (51.7%, 61.7%, 43.3% and 48.3%) had incomplete knowledge about DNA, Mendel's law of genetics, environmental factors impact on the gene and the human genome project on posttest compared to18.3%, 0.0%, 5.0% and1.7% on pretest. For this reason, there was a highly statistically significant difference between nurses at1% level of statistical significance.

Table 3 reflected basic knowledge of nurses about genetic diseases on pre, post and follow up tests. As illustrated in the table, it was clear that no nurse had complete knowledge on pretest about the definition of genetic diseases, mode of transmission, identification of patients with genetic diseases and specific genetic diseases information compared to 98.3%, 91.7%, 94.9% and 85.0% on the posttest. For this reason, there were highly statistically significant differences between nurses at1% level of statistical significance.

Table 4 displayed basic knowledge of nurses about genetic counseling on pre, post and follow up tests. The findings of this study showed that 96.7%, 81.7%, 81.7% and 68.3% of studied nurses had complete knowledge on posttest about the definition of genetic counseling, genetic counseling steps, family pedigree symbols and ethical aspects of genetic compared to none on the pretest. For this reason, there were highly statistically significant differences between nurses' knowledge at1% level of statistical significance.

Table 5 reflected basic knowledge of nurses about genetic tests on pre, post and follow up tests. On posttest and follow-up tests, nurses who had complete knowledge about genetic tests before marriage, during pregnancy, after birth and genetic survey were 61.7%, 45.0%, 28.3% and 8.3% then pre-test. For this reason, there were highly statistically significant differences between nurses' knowledge at1% level of statistical significance.

Table 6 showed means score of nurses' knowledge about genetics and genetic counseling on pre, post and follow up tests**.** As indicated in the table, the mean and standard deviation of knowledge scores on pretest were 6.38±2.9 compared to35.7±5.9 and 34.6± 6.4 on post and follow-up tests respectively. Therefore there were highly statistically significant differences between nurses' knowledge at1% level of statistically significant

Figure 2 showed mean score of nurses' knowledge on pre, post and follow-up tests in study settings. Nurses had the highest level of mean scores of knowledge on the posttest.

Table 7 showed the level of nurses on pre, post and follow-up tests. As indicated in the table, the majority of nurses (95.0% and 100%) had good knowledge on posttest and follow-up test compared to all of them (100%) had poor of knowledge on the pretest. Therefore there were highly statistically significant differences between nurses' knowledge after introduced of a guideline module at1% level of statistical significance.

Table (1) Characteristics of studied nurses

Characteristics	No	%
Age		
18-<21 years	9	15.0
21-<35 years	35	58.3
35-<50 years	13	21.7
above 50 years	3	5.0
Mean & SD	31.2± 9.1	
Position		
Nurse	53	88.3
Supervisor	7	11.7
Qualifications		
Diploma in nursing	21	35.0
Specialty diploma	12	20.0
Technical Institute of nursing	15	25.0
Bachelor or post-graduate studies	12	20.0
The working hospital		
El-Menoufia University hospital	36	60.0
Bahary MCH	14	23.3
Kebaly MCH	10	16.7
Working Department		
Pediatric department	13	21.7
Pediatric Surgery	4	6.7
Neonatal intensive care unit	9	15.0
MCH	25	41.7
Out-patient clinics for children	4	6.7
Pediatric intensive care unit	5	8.3
Nurses years of experience		
< 5 years	15	25.0
5 - <10 years	17	28.3
10 - <15 years	10	16.7
15 - <20 years	7	11.7
Mean & SD	11.9 ± 9.3	

MCH = Maternal and Child Health Center

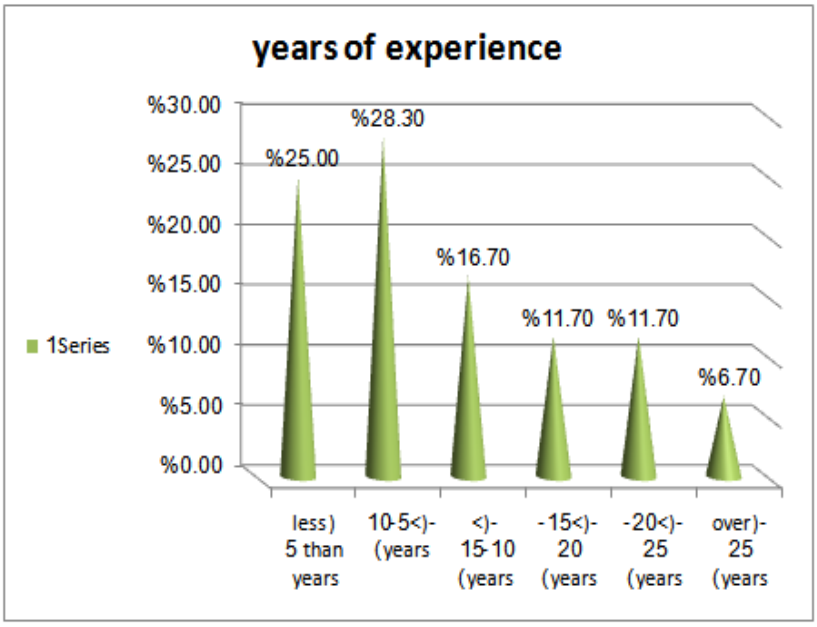

Figure (1):- Nurses years of experience

Table (2) Basic knowledge of nurses about genetics on pre, post and follow up tests

Items	Pre		Post		Follow up		X^2	P.value
	No	%	No	%	No	%		
what is the cell								
Do not know	27	45.0	0	0.0	2	3.4	X1: 1.13	P1: <0.001
Incomplete answer	33	55.0	2	3.3	2	3.4	X2:1.08	P2: <0.001
Complete answer	0	0.0	58	96.7	56	94.9		
what is a chromosome								
Do not know	47	78.3	0	0.0	2	3.4	X1: 87.95	P1: <0.001
Incomplete answer	13	21.7	17	28.3	23	39.0	X2:83.53	P2: <0.001
Complete answer	0	0.0	43	71.7	35	59.3		
what is the gene								
Do not know	48	80.0	4	6.7	2	3.4	X1: 73.23	P1: <0.001
Incomplete answer	12	20.0	24	40.0	28	47.5	X2:77.7	P2: <0.001
Complete answer	0	0.0	32	53.3	29	50.9		
what is the DNA								
Do not know	49	81.7	6	10.0	4	6.7	X1: 66.14	P1: <0.001
Incomplete answer	11	18.3	31	51.7	30	50.0	X2: 72.0	P2: <0.001
Complete answer	0	0.0	23	38.3	26	43.3		
what is mitosis								
Do not know	54	90.0	1	1.7	5	8.3	X1: 96.18	P1: <0.001
Incomplete answer	6	10.0	29	48.3	29	48.3	X2:84.21	P2: <0.001
Complete answer	0	0.0	30	50.0	26	43.3		
what is meiosis								
Do not know	54	90.0	1	1.7	3	5.1	X1: 96.19	P1: <0.001
Incomplete answer	6	10.0	29	48.3	30	50.8	X2:87.63	P2: <0.001
Complete answer	0	0.0	30	50.0	27	45.8		
Mendel's law of genetics								
Do not know	60	100.0	22	36.7	26	43.3	X1: 55.61	P1: <0.001
Incomplete answer	0	0.0	37	61.7	30	50.0	X2:47.4	P2: <0.001
Complete answer	0	0.0	1	1.7	4	6.7		
Environmental factors impact on the gene							X1: 41.69	P1: <0.001
Do not know	57	95.0	24	40.0	23	38.3	X2:43.7	P2: <0.001
Incomplete answer	3	5.0	26	43.3	26	43.3		
Complete answer	0	0.0	10	16.7	11	18.3		
the human genome								
Do not know	59	98.3	21	35.0	14	23.3	X1: 54.18	P1: <0.001
Incomplete answer	1	1.7	29	48.3	31	51.7	X2:69.9	P2: <0.001
Complete answer	0	0.0	10	16.7	14	23.3		

$X^2$1,P1 Pre regarding post * $X^2$2, P2 pre regarding follow up

- **DNA = deoxyribonucleic acid χ^2 = chi squire P<0.001 highly significant**

Table (3) Basic knowledge of nurses about genetic diseases on pre, post and follow up tests

Items	Pre		Post		Follow up		X^2	P.value
	No	%	No	%	No	%		
Defining genetic diseases								
Do not know	12	20.0	0	0.0	2	3.3	X1: 1.16	P1: <0.001
Incomplete answer	48	80.0	1	1.7	2	3.3	X2: 1.06	P2: <0.001
Complete answer	0	0.0	59	98.3	56	93.4		
How are genetic diseases inherited (mode of transmission)?								
Do not know	25	41.7	0	0.0	2	3.3	X1: 1.03	P1: <0.001
Incomplete answer	35	58.3	5	8.3	8	13.6	X2: 89.1	P2: <0.001
Complete answer	0	0.0	55	91.7	50	83.1		
Identifying patients with genetic diseases in workplace								
Do not know	16	26.7	0	0.0	1	1.7	X1: 1.09	P1: <0.001
Incomplete answer	44	73.3	3	5.1	26	43.3	X2: 1.12	P2: <0.001
Complete answer	0	0.0	57	94.9	33	55.0		
Knowing specific genetic diseases information to ask patients about								
Do not know	37	61.7	0	0.0	0	0.0	X1: 94.13	P1: <0.001
Incomplete answer	23	38.3	9	15.0	10	16.7	X2: 92.1	P2: <0.001
Complete answer	0	0.0	51	85.0	50	83.3		

- **$X^2$1, P1 Pre regarding post * $X^2$2, P2 pre regarding follow up**
- **χ^2 = chi squire P<0.001 highly significant**

Table (4) Basic knowledge of nurses about genetic counseling on pre, post and follow up tests

Items	Pre		Post		Follow up		X^2	P.value
	No	%	No	%	No	%		
Defining genetic counseling?								
Do not know	52	86.7	0	0.0	0	0.0	X1: 1.14	P1: <0.001
Incomplete answer	8	13.3	2	3.3	2	3.3	X2: 1.14	P2: <0.001
Complete answer	0	0.0	58	96.7	58	96.7		
Genetic counseling steps								
Do not know	59	98.3	0	0.0	0	0.0	X1: 1.16	P1: <0.001
Incomplete answer	1	1.7	11	18.3	11	18.3	X2: 1.16	P2: <0.001
Complete answer	0	0.0	49	81.7	49	81.7		
family pedigree symbols								
Do not know	60	100.0	0	0.0	0	0.0	X1: 1.2	P1: <0.001
Incomplete answer	0	0.0	11	18.3	11	18.3	X2: 1.2	P2: <0.001
Complete answer	0	0.0	49	81.7	49	81.7		
Ethical aspects of genetic counseling								
Do not know	58	96.7	1	1.7	1	1.7	X1: 1.09	P1: <0.001
Incomplete answer	2	3.3	18	30.0	18	30.0	X2: 1.09	P2: <0.001
Complete answer	0	0.0	41	68.3	41	68.3		

- **$X^2$1, P1 Pre regarding post * $X^2$2, P2 pre regarding follow up**
- **χ^2 = chi squire P<0.001 highly significant**

Table (5) Basic knowledge of nurses about genetic tests on pre, post and follow up tests

Items	Pre		Post		Follow up		X^2	P. value
	No	%	No	%	No	%		
Detection of hereditary diseases before marriage							X1: 73.02	P1: <0.001
Do not know	36	60.0	0	0.0	0	0.0	X2: 73.02	P2: <0.001
Incomplete answer	24	40.0	23	38.3	23	38.3		
Complete answer	0	0.0	37	61.7	37	61.7		
Detection of genetic diseases during pregnancy							X1: 62.58	P1: <0.001
Do not know	37	61.7	1	1.7	1	1.7	X2: 62.58	P2: <0.001
Incomplete answer	23	38.3	32	53.3	32	53.3		
Complete answer	0	0.0	27	45.0	27	45.0		
Detection of genetic diseases after birth								
Do not know	53	88.3	3	5.0	3	5.0	X1: 84.81	P1: <0.001
Incomplete answer	7	11.7	40	66.7	40	66.7	X2: 84.81	P2: <0.001
Complete answer	0	0.0	17	28.3	17	28.3		
What is the genetic survey?								
Do not know	60	100.0	32	53.3	32	53.3	X1: 36.52	P1: <0.001
Incomplete answer	0	0.0	23	38.3	23	38.3	X2: 36.52	P2: <0.001
Complete answer	0	0.0	5	8.3	5	8.3		

- **$X^2$1,P1 Pre regarding post** *** $X^2$2, P2 pre regarding follow up**
- **χ^2 = chi squire** **P<0.001 highly significant**

Table (6) Means and standard deviation of total knowledge of studied nurses on pre, post and follow up tests**.**

Total knowledge score	Pre	Post	Follow up	Friedman test	P -value
Mean & SD X ± SD	6.38±2.9	35.7±5.9	34.6± 6.4	93.241	<0.001

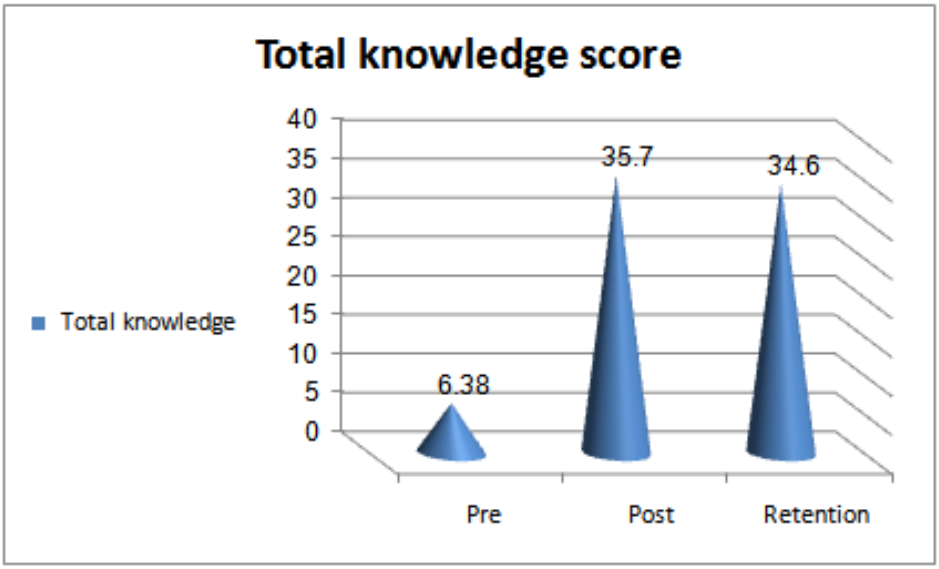

Figure (2) Mean of total knowledge scores of nurses

Table (7) Level of knowledge of nurses on pre, post and follow-up tests

Total knowledge	Pre		Post		Follow up		χ^2	P -value
	N	%	N	%	N	%		
Poor knowledge	60	100.0	3	5.0	0	0.0	1.67	<0.001
Good knowledge	0	0.0	57	95.0	60	100.0		

χ^2 = chi squire **P<0.001 highly significant**

IX. Discussion

Hereditary diseases and congenital malformations affect 2–5% of all live births. And before the age of 25, at least 53 out of 1000 live-born individuals are expected to have a disease with an important genetic component [22]. For this reason, all pediatric nurses regardless of country or practice setting, need to be appropriately trained in genetics and genomics in order to provide best practices for prevention, recognition and/or treatment of diseases. The focus of this study was to evaluate nurses' knowledge and skills in conducting genetic counseling, design, implement and evaluate the effect of a guideline module on nurses' knowledge and skills. This study is a quasi-experimental research hypothesized that 1-Pediatric nurses in selected settings had inadequate knowledge and skills for conducting genetic counseling; 2- Pediatric nurses in selected settings will have adequate knowledge and skills for conducting genetic counseling after implementing a standardized guideline module. Regarding characteristics of studied nurses, the result of the present study revealed that the mean and standard deviation of nurses' age was 31.2 ±9.1 and the large percentage of them were diploma nurses. This result was consistent with [23] who revealed in his study about "**Effect Safety Blood Transfusion Protocol on the Occurrence of Acute Adverse Reaction in Children at El-Menoufia University Hospital** "that the mean age of studied nurses was 29.07± 4.98 years. Also, it was consistent with [24] who revealed in

his study about **"Economic Analysis of the Nurse Shortage in Egypt"** that the majority of nurses had limited education and experience especially in dealing with families having hereditary or genetic diseases. This reflected nurses intensive need for training programs to deal with parents having hereditary diseases in their families. Also, the current study showed that the majority of nurses had either five to less than ten years of experience and none of them had previous training in genetic counseling. Such a finding was in line with [17] who stated in his study about " **Role of the nurse in counseling parents of children with hereditary diseases** ". that the majority of nurses had less than five years of experience. This could show nurses' lack of knowledge and experience to provide nursing management for families and children with hereditary diseases. For this reason, the nurses needed educational programs about role of nurse in the identification and management of hereditary diseases In addition, Agency of Health Care Research Quality identified that in order to achieve quality; nurses should keep learning and conducting research rather than being stagnated in their educational background [25]. Regarding basic knowledge of nurses about genetics, it was found that approximately all nurses had poor knowledge about genetics on the pretest. This finding was in agreement with [26]who stated in their study about "**A systematic review of nurses' knowledge of genetics "** that both actual and perceived knowledge of nurses about genetics was generally poor.Meanwhile ,on the post and follow-up tests, the finding showed that approximately all nurses had adequate knowledge about the majority of items related to genetics. This finding was in line with [18] who mentioned in their study about **" Nurses' professed knowledge of Genetics and Genetic Counseling"** that implementing the training program for nurses increased knowledge of Professional nurses and improved their care of children.Concerning comparison between nurses' knowledge about genetic diseases, it was found that approximately all nurses on posttest had complete knowledge about the definition of genetic diseases, mode of transmission, identification of patients with genetic diseases and specific genetic diseases information on post-test compared to pretest. This study came in agreement with [11] who stated in their study **about "Genetics and Genomics in Nursing: Evaluating Essentials Implementation"** that educational program equipped the nurses with the required knowledge that would enable them to provide safe care and integrate their knowledge into practice. In relation to the basic nurses' knowledge about genetic counseling, the present study revealed that studied nurses had complete knowledge on the post and follow -up tests about the definition of genetic counseling, genetic counseling steps, family pedigree symbols and ethical aspects of genetic compared to none of them were knowledgeable on the pretest. In other word, nurses who participated in the educational module become more knowledgeable about genetics. These findings were consistent with [27] who stated in their study about "**Genetic education for primary care providers; Improving attitudes, knowledge, and confidence"** that there was a significant improvement in nurses' knowledge and skills related to genetic disorders. Also, there was an improvement in their core competencies. This could reveal the effect of conducting workshops and utilizing educational modules on nurses' knowledge and skills.Regarding basic nurses' knowledge about genetic tests. The present study revealed that studied nurses had complete knowledge on post and follow -up tests about genetic tests before marriage, during pregnancy, after birth and genetic survey These findings were in line of agreement with [22] in their study about " **Congenital malformations prevalent among Egyptian children and associated risk factors".** They emphasized the importance of in-service training programs for nurses to improve their knowledge and practices. Adequate knowledge about carrier detection, genetic counseling, premarital diagnosis, neonatal screening, preconception tests, prenatal diagnosis and selective screening programs helps in the prevention and early detection of future genetic disorders.On follow-up test, it was noticed that total knowledge score was less than on immediate posttest. This reduction in knowledge might be due to the elapse of a long period of time (three months) after conducting educational sessions. This could reflect that nurses could be in need for continuous in-service education programs.Concerning distribution of nurses according to their level of knowledge on pre, post and follow-up tests. Although nurses had poor knowledge on the pretest, they had good knowledge on post and follow-up test. These findings support the first and second research hypothesis .This could be attributed to the effect of providing educational sessions and guideline module about genetics and genetic counseling. However, integration between knowledge and practice is required to enable nurses to fully utilize genetics for the benefit of patients and families [26].This improvement in nurses level of knowledge could be attributed to the provision of presents during the sessions in the form of a booklet and posters about genetics and genetic counseling. Also, during the sessions, the researchers provide information about how to collect family history, constrict family pedigree, identifying hazards, providing care, referral, and support for the clients

X. Conclusion

Based on the findings of the current study, it is concluded that pediatric nurse in selected settings had in adequate knowledge and skills for conductinggenetic counseling on the pretest .Meanwhile, on posttest pediatric nurses in selected settings had an adequate knowledge and skills about genetics contents and genetic counseling after implementing a standardized guideline module than on pretest.

XI. Recommendations

Based on the findings of the current study, the following recommendations can be suggested:-

1) Insert fundamental courses related to genetics and genetic counseling in the clinical training for all levels of nursing education.
2) In-service educational programs must be prepared for all pediatric nurses about basics of genetics and genetic counseling.
3) All nurses must be aware of all community services regarding caring for genetics disease as places of genetic counseling, places for genetic tests, and financial resources for supporting these cases.
4) Future studies in this field are needed to examine the effects of guideline module on a larger sample size of nurses to provide more reliable results for generalization.

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