INTERNATIONAL JOURNAL OF NURSING AND MEDICAL SCIENCE

PANACEA INTERNATIONAL JOURNAL   PRL PUBLISHER

Nursing Education Health Science Research

HEALTH EDUCATION PROGRAM FOR NURSES WORKING IN RURAL HEALTH UNITS AT ASHMOUN, MENUOFIA GOVERNORATE ABOUT NEWBORN HEEL STICK

[1]Noha Ahmmad Mohamed, [2]Dr. SalwaAbas Ali, [3]Dr. Afaf Salah Abd El- Mohsen, [4]Dr. Sahar Ahmad Shafik

[1]Nursing Supervisor in Ashmoun Health District, [2]Professor of Community Health Nursing**,** Faculty of Nursing - Zagazig University, [3]Professor of Community Health Nursing Faculty of Nursing - Helwan University,[4]Professor of Community Health Nursing Faculty of Nursing-Helwan University

Corresponding Author's Email id: noha.grada@gmail.com

ABSTRACT

Background: Newborn heel stick is a public health activity aimed at early identification of newborns affected with certain genetic and/or metabolic conditions. Early diagnosis and treatment of these conditions has been shown in many cases to reduce morbidity, premature death, mental retardation and other developmental disabilities. **Aim of the study**: this study aims to evaluate the effectiveness of health education program for nurses working in rural health Units at Ashmoun, Menuofia Governorate about newborn heel stick. **Sample**: A purposive sample of 150 nurses was recruited the study. **Design:** A quasi experimental design was used**. Setting:** The study was carried out in 22 rural health unit at Ashmoun, Menuofia, Governorate. **Tools:** two tools: tool I, it covered the general characteristics of the nurses, nurses knowledge about newborn heel stick test, congenital hypothyroidism and   phenyl ketonuria, tool II, Observation checklist to assess nurses' practice. **Results:** shows statistical significant improvement in nurses' knowledge level at the post health educational program than that of pre and follow up –test in all knowledge items, P = 0.001. and Showed that statistical significant improvement in nurses' done practice at the post health education program, than that of pre and follow up – test in all practice items regarding collectheel stick sample. **Conclusion**: The study concluded nurses knowledge and practice improved post health education program related newborn heel stick collected sample for early detection of hypothyroidism and phenylketonuria in rural health units at Ashmoun, Menuofia Governorate. **Recommendations:** Implementation continuous training program for nurses of the rural health units about newborn heel stick, Inform nurses and mothers about important of newborn heel stick and referral places for positive results, Booklet contain all information about heel stick test should be available in all health care units provide newborn care and Further research: Improving nurses education program about the newborn heel stick in the Egypt.

Keywords: Newborn heel stick**,** Nurses, Health education program.

INTRODUCTION

Newborn Screening Program (Heel Stick) was applied to ensure that all newborns are screened with results processed within seven days of birth, to ensure that all affected newbornreceive appropriate confirmatory testing, counseling,and initiation of treatment as soon as possible, to provide physician consultation with other healthcare providers regarding treatmentoptions and recommendations,and to provide an educational information program for the various healthcare providers that Serve families,*(Washington State Department of Health, 2016).*

Newborn Heel stick is used to identify newborns with conditions that are amenable to early treatment. Heel stick samples for newborn screening(NBS) are obtained from newborns after birth (within the first 48 hours- 7 days). Samples are applied to special filter paper, dried, and sent to designated screening laboratories for analysis. Techniques used to analyze sample depend on the specified disorder. For example, NBS for congenital hypothyroidism and phenylketonuria (PKU)*(Tluczek&Deluca, 2013).*

Congenital hypothyroidism (CH) is one of the most common preventable causes of mental retardation. newborn screening programs allow for the early detection and treatment of CH, thus preventing the mental retardation that results from the lack of thyroid hormone*(Bekhit and Yousef, 2013).*

In rare cases, CH may resultfrom a pituitary or hypothalamic abnormality (central orsecondary/tertiary hypothyroidism). Recent advances in molecular and cell biology have led to improved understanding of normal thyroid physiology and of genes involved in thyroid gland development and disease. In addition, the mechanism and precise temporal sequenceof thyroid hormone (TH) modulation of target gene expression are being elucidated*(State of Illinois Department of Public Health, 2015).*

Prevalence rate for congenital hypothyroidism to the populations of various countries and regions. Approximately 5. 6% in Egypt, in addition 21.5% in United States of American(USA), 4.4% in France, 9.3% in Japan, and 1.9% in Saudi Arabia suffer from thyroid disorder. in additionthe prevalence rate of Phenylketonuria of various countries and regions.*(Health Grades,2014).*

Phenylketonuria (PKU) is the most common metaboliccause of mental retardation. increased concentrations of Phenylalanine (Phe) in PKU have a neurotoxic effect, contributing to the structural brain damage, severe mental retardation, and psychiatric disturbances. *(Alkhazrajyand Hassan,2016).*

The incidence of PKU varies widely in different human populations. A low incidence is reported in African Americans (1/50,000). Turkey has the highest documented rate in the world, with approximately 1 case in 2600 births, while countries such as Finland and Japan have extremely low rates with less than one case of PKU in 100,000 births. These disorders are equally frequent in males and females*(Fouad&AbdElmoneem, 2016).*

Newborn health education program enhanced the newborn and mother health. Moreover, it increased maternal knowledge of newborn care and maternal confidence; and reduced mothers'anxiety. Thus, this educational program could be integrated into routine educational programs to promote maternal and newborn well-being *(Saad& et al, 2013).*

According to the*National Health System, (2014)*, reported that, once the sample has been collected it should be dried horizontally (flat) on a nonabsorbent open surface. special racks are available for drying or can be easily constructed. filter papercards must not be refrigerated, stored in drawers or closets, placed in plastic sleeves, norexposed to intense heat or direct sunlight. heel stick sample must be taken inhandling the cards so that the blood spots are not touched or smeared accidentally. depending onthe local environment, samples may take several hours to dry, so a minimum of 4 hours of airdrying (ambient temperature of 15-22o.C) away from direct sunlight should be required. since leaching, direct blood spot toblood spot contact should be avoided. Before placing the samples in a container or envelope for transport.

Patricia and Wheeler, (2016), cited that, collection cards should be transported or mailed to the testing laboratory within 24 hours after sample collection. use of sealed plastic bags or other shipping containers that are impermeableto air are not recommended since moisture may build up inside the envelope and cause bacterialcontamination. similarly, excessive heat should be avoided during transport,

especially if it isexcessive and prolonged. samples known to be biohazardous should be identified as such andtransported with special precautions.

Role of the community health nurse, collects blood spots from the newborn's heel at 48 hours -7 days of age, write the newborn and mother information on the card before collecting the blood sample and applied aseptic technique principles. *(Deluca and et al. 2013).* In addition, ensuring sufficient blood has soaked through both sides, air dry the card without the use of heat and transport in envelope, not a plastic bag. the nurses reports the date of blood spot collection for screening on the newborn's paper health record and provider informing parents about the results, then referral to health insurance for the follow-up.*(public health England,2016).*

Significant of the study:

Nurses are often the first line of defense and safety when it comes to educating parents and managing the entire newborn screening process to ensure healthy outcomes for families. Among other responsibilities; filling pristine paper work; and following up with families, laboratories and doctors.*(Khaton, 2016).*

Primary of health care nurse either in maternal and child health centers or in rural health units can provide health education to the population about the disease, importance of national program for screening test, it's exact time, importance, how test result will be conveyed to parents and what to expect in the event of an abnormal result. She takes the opportunity for practicing communication skills for conveying complex information to parents and families*(Mohamed& et al, 2019).*

Congenital hypothyroidism, a condition caused by a thyroid hormone deficiency, affects an estimated one in every 1,400 newborns in Egypt . Approximately 5.6% in Egypt suffer from hypothyroidism.*(Health grades, 2014)*. If left untreated within the first few months of life, it can lead to severe growth issues and mental development delays.*(American Thyroid Association,2013***).**

Until now, no incidence rate was reported at national level in Egypt, because screening practice for PKU does not include all neonates but sporadic studies were done. Screening for phenylketonuria among Egyptian newborns in Menoufiya governorate was conducted and revealed a prevalence of 1/3000. The national program for the early detection of disability diseases in newborns conduct two pilot study in

both 2012 and 2013 to assess the prevalence of the disease by random samples from 9 governorates and the results confirmed high incidence of PKU 1/7000. Another study conducted in Pediatric neurology clinic, Sohag University Hospital assesses clinical laboratory profile diagnosed 24 cases with phenylketonuria PKU during the period of the study *(Khaton, 2016).*

The extrapolations of prevalence and incidence statistics for phenylketonuria by countries and regions 2015,which gives only a general indication as to the actual prevalence or incidence of phenylketonuria in each region revealed that in the Middle East region, extrapolated incidence to population estimated used was 14% in Iraq; 11% in Libya; 10% in Egypt.*(Fouad&AbdElmoneem, (2016).*

Nurses are often the first line of defense and safety when it comes to educating parents and managing the entire newborn screening process to ensure healthy outcomes for families. Among other responsibilities; filling pristine paper work; and following up with families, laboratories and doctors.*(Khaton, 2016).*

Primary of health care nurse either in maternal and child health centers or in rural health units can provide health education to the population about the disease, importance of national program for screening test, it's exact time, importance, how test result will be conveyed to parents and what to expect in the event of an abnormal result. She takes the opportunity for practicing communication skills for conveying complex information to parents and families*(Mohamed& et al 2019).*

Aim of the study

The aim of this study was to evaluate the effectiveness of health education program for nurses working in rural health units at Ashmoun, Menuofia Governorate about newborn heel stick through the following objectives:

1. Assess nursing knowledge and practice to detect nurses educational needs.
2. Designing and implementing health education program.
3. Evaluate the effect of health education program.

Research hypothesis:

Health educational program will improve staff nurses knowledge and practice regarding newborn heel stick test.

Subjects and Methods

The methodology for this study was presented under the following four designs :

I.   Technical design

II. Operational design

III. Administration design

IV. Statistical design

I.   Technical design

The technical design included the research design, study setting, the study subjects and tools for data collection.

a- Research design:

A Quasi experimental research design was used in this study.

b- Research setting:

The study was carried out in 22 rural health unit it equal (50% from the total units) was selected randomly from 44 rural health units at Ashmoun, Menuofia, Governorate. Randomization was done by using complete generated tables in closed envelop, This units are, Shanshoor, Tahawey, Smadon, Shama, Sobkalahid, Talia, Halawas, Dalhamo, Ramlet Len Jib, Manal Deweeb, Mahlet Sobk, Mounsa, Shoshai, Migria, Kafer abo - Mahmoud, Ouras, Grees, EzbetTa'imah, Abo-auali, Len Jib, Abo –Rakaba and Manalaros rural health unit.

Randomization was done by using complete generated tables in closed envelop, this units are**;**

The rural health units offer many services as vaccination , chronic disease discover and follow up , outpatient clinic , dental services, maternal and child health (antenatal care –natal care and post natal care, newborn heel stick sample), birth and death registration, laboratory services, emergency services, family planning, laboratory services and referral system. newborn heel stick room contain shannon, desk, chairs, safety books, two basket, weight and height

measure and heel stick supplies such as rack, filter paper, sterile cotton, gloves, alcohol wipe, heel warm device and a heel-lancing device.

	Units	Total number of the nurses in the units	Number the Responsible nurses about taking the heel stick sample
1	Shanshoor	9	7
2	Tahawey	8	6
3	Smadon	16	13
4	Shama	10	7
5	Sobkalahid	23	17
6	Talia	9	6
7	Halawas	6	4
8	Dalhamo	3	3
9	RamletLenJib	8	6
10	ManalDeweeb	8	6
11	MahletSobk	8	5
12	Mounsa	6	4
13	Shoshai	15	10
14	Migria	9	6
15	Kafer abo Mahmoud	13	10
16	Ouras	9	7
17	Grees	14	11
18	EzbetTa'imah	6	4
19	Aboauali	6	4
20	Len Jib	8	6
21	Abo Rakaba	8	5
22	Manalaros	5	3
Total		**207**	**150**

c- Sample:

A purposive sample of150 nurse who responsible for collect newborn heel stick sample at the rural health units in the above mentioned setting was included in the study sample.

Sample size:

Total number of nurses working in the studied rural health units were 207nurse. the researcher select 150 staff nurse responsible about collect newborn heel stick sample to conduct the study sample.

d- Tools for data collection:

A structured interviewing questionnaire sheet was developed by researcher after reviewing the national and international related literature and observation checklist.

Tool I :Structure interview questionnaire composed of two parts:-

Part I: It covered the general characteristics of the nurses such as   age, level of education, years of experience and attended training program about newborn heel stick

Part II: Nurses knowledge about newborn heel stick test. It contain three section:

1st section: Nurses knowledge about newborn heel stick: It cover   13closed ended question about heel stick test such as , meaning of newborn heel stick test, right place for take the heel stick sample, the suitable time to take the first sample, the suitable time to take the repeated sample, reasons for taking the sample in the central labs in Cairo, Reasons for taking the sample, transport line for the heel stick sample, causes for the heel stick sample are invalid, samples are transport from units to the district, action taking toward the positive samples, storing the filter paper in the unit before taking the sampling, heel stick samples sent to the district from 1 o'clock to 3 o'clock and save the information about positive results in the rural health units' records.

2nd section:Nurses knowledge about congenital hypothyroidism: Which includes ,four closed ended question such as, meaning of the congenital hypothyroidism, time of thyroid gland formation in the body, site of the thyroid gland and causes of the congenital hypothyroidism.

3rd section :*Nurses knowledge about phenylketonuria*: It contain three closed ended question, such as   meaning of the phenylketonuria, deal   with the suspect phenylketonuria sample and deal with the positive result of phenylketonuria.

Scoring system:-

It was determined through:

- Correct answer = 1

- Incorrect answer / don't know answer = 0

The total score = 20points, and scored as the following:

- Good knowledge 70-100% .

- Average knowledge 50 < 70 %.

- Poor knowledge <50%.

Tool II: Observation checklist it was designed to assess nurses practice throughout the process of heel stick: it contain five parts;

1-The place: Three closed end question to describe the place of
collecting sample it was, specific place, clean and organized.

2- Supplies: This part contain 9 closed end question such as,filter paper   (enough for two weeks), puncture devices (single use), alcohol wipes (are enough for two week), disposable gloves, sterile cotton, medical plaster, filter paper rack, safety box and towel for warmth the heel stick site.

3-Newborn preparation; which include three closed end questionsuch as, ensure the newborn is breast feeding before taking the sample,   ensure   newborn's   age   (3-7 days) and warmth the baby heel for   three minutes.

4-Take heel stick sample; This part contain (11) questions cover the following data ; write the newborn and mother information on the blood spot card before the sample taken, wash hand, apply gloves, ensure the newborn's heel is down,clean the heel site by using cotton wool/gauze, taking the sample from the specific site(The heel is pricked The outers part from either side), remove first drop from the blood, allow the blood to fill the circle by natural flow, cover heel stick site by medical plaster, allow blood sample card in air to dry and transport the sample in paper envelope after completely dry. *5-After taking the heel sticksample*; It is the last part of the cheek list which include (6) closed end questions to collect data about , collect and dispose the remain equipment before remove the gloves, record the newborn information in the unit records, send the sample to the health district, give health education for the parents about importance of newborn screening and importance follow-up the heel stick result, receive the sample results from the district and inform the newborn's parents about sample result that needs to be repeated and the date of repeated*.*

Scoring system:

The questions coded the practice as following;

Done = 1

Not done = 0

The total score = 32points, and scored as the following:

- Good done practice= 70-100%
- Average done practice 50 < 70 %.

- Poor done practice <50%.

II. Administrative design:

An official permission was obtained from the Dean of the Faculty of Nursing, Helwan University to the manager of the Ashmoun health district, Menuofia

Governorate to get an written consent for data collection to conduct the study and practice the study in the rural health units at Ashmoun, Menuofia Governorate.

III: Operational design

The study to be completed passed through different phases included: preparatory phases, pilot phase, filed work phase.

a) Preparatory phase:

It included reviewing of national and international relate literature using journal, magazines, periodicals, textbook, internet and theoretical knowledge of the various aspect of this issue in order to develop the data collection tools.

b) Pilot study:

It was conducted on 15 nurses. They presented 10% of the total study sample. The aim of the pilot study was to evaluate the applicability and clarity of tools and estimate the time needed for the intervention. According to the obtained results no modifications were done. The sample of pilot study was included into the total sample.It was conducted at March 2017.

Tools content validity:

Validity indicated the degree to which the tool measures what it is expected to measure. It was tested through five experts from community health nursing at faculty of nursing Helwan University and faculty of nursing Zagazig University to measure validity of tools and necessary modifications were carried out according to the panel judgment on clarity of the sentences and appropriateness of the contents.

Reliability:

A reliability analysis was carried out in order to examine the internal consistency of its questions and identify the extent to which the items of tools measured the same concept and correlate with each other. The reliability was measured by Cronbach's Alpha coefficient test. The value of Cronbach's Alpha reliability was 0.84**.**

C- Field work:

- An official permission was obtained from the Dean of the Faculty of Nursing, Helwan University to the manager of the Ashmoun health district, MenuofiaGovernorate to get an consent for data collection to conduct the study and practice the study in the rural health units at Ashmoun, Menuofia Governorate.
- Inform consent was obtained from nursing staff after explaining the purpose of the study.

- The study work was carried out within eleven month from March (2017) to January (2018). Two days per week Saturday and Tuesday (this two days for collect the sample from the newborn)   per week from 10 am-12 pm.
- The session of the program conducted in the family club room in each rural health unit which was clean and good ventilated. The program was implemented for each unit in four sessions., study tools taking 30 minutes to be fulfilled and 30 minutes break between each session.
- Study was conducted by researcher first by distribution of the tools to the nurses. newborn heel stick program was developed based on the result obtained from the pre-test questionnaire. The plan of newborn heel stick program was prepared, implemented, and evaluated the degree of improvement in study group condition in relation to newborn heel stick program objectives.
- By the end of each session, the nurses were informed about the content of the next session and its time.

The evaluation phase occurred immediately after the program and after three months to assess the effect of health education program.

IV- Statistical design:

The collected data were computerized and statistically analyzed using SPSS program (Statistical Package for Social Science) version 22. Qualitative data were

represented as frequencies and relative percentages. Chi square test was used to calculate difference between qualitative variables through this equation:

Where:
$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

Σ=sum   O= observed value.   E= expected value.

Quantitative data were expressed as mean ± SD (Standard deviation) though I- Arithmetic Mean:

$\overline{X} = \Sigma x / n$ Where: Σx = sum of individual data.   n = number of individual data.

Pearson correlation coefficient used to calculate correlation between quantitative variables through this equation:

$$r = \frac{t}{\sqrt{n-2+t^2}}.$$ Where:

t= independent sample t test value.   n= no of cases.

We consider (+) sign as indication for direct correlation i.e. increase frequency of independent lead to increase frequency of dependent & (-) sign as indication for inverse correlation i.e. increase frequency of independent lead to decrease frequency of dependent, also we consider values near to 1 as strong correlation & values near 0 as weak correlation. Binary logistic regression analysis was used to find significant predictors for different parameters among the studied elderly. The significance Level for all above mentioned statistical tests done. The threshold of significance is fixed at 5% level (P-value). P value of >0.05 indicates non-significant results. P value of <0.05 indicates significant results. P value of <0.01 indicates highly significant results.

RESULTS

As shown in **table (2)**, improvement of the nurse's correct knowledge regarding the newborn heel stickafter the program implementation in all items to good knowledge

score regarding, meaning of newborn heel stick test, right place for take the heel stick sample, the suitable time to take the first sample, action taking toward the positive samples and storing the filter paper in the unit before taking the sampling 90.0%, 88.0%, 88.0%, 89.3%, 90.0%, respectively. There is was statistically significant differences between pre, post and follow- up the program.

Figure (II) showed that, nurses' total correct knowledge score about newborn heel stick, congenital hypothyroidism and phenylketonuria, it was found that before program implementation 55% of nurses had poor knowledge score. on the other hand 90% of nurses had good knowledge score at post health education program and 80% of nurses had good knowledge score at follow-up newborn heal stick health education program.

As reported in **table (6)**shows statistical significant improvement in nurses' done practice level at the post health education program- test, than that of pre and follow up – test in all practice items regarding the newborn preparation ,P = 0.001 **.**

Table (10) showed that, there was astatically significant between total knowledge and total done practice for newborn heel stick.

Tables

Part II: According to research hypothesis health educational program will improve nurses **knowledge** and practices regarding Newborn Heel Stick test. (Table 2,3, &4).

Table (2): Frequency distribution of the nurses' correct knowledge regarding Newborn Heel Stick pre, post and follow- up program (no=150).

Correct knowledge	Pre-program		Post –program		Follow-up		Paired t test	P value
	No	%	No	%	No	%		
Meaning of newborn heel stick test	62	41.3	135	90.0	109	72.7	35.034* *77.308*	0.001*
Right place for take the heel stick sample	107	71.3	132	88.0	122	81.3	*35.483 **64.949	0.001*
The suitable time to take the first sample	108	72.0	132	88.0	122	81.3	35.216* **46.760	0.001*
The suitable time to take the repeated sample	58	38.7	136	90.7	108	72.5	*32.837 **80.007	0.001*
Reasons for taking the sample in the central labs in Cairo	92	61.3	129	86.0	113	75.3	*38.782 **60.707	0.001*
Reasons for taking the sample	116	77.3	135	90.0	120	80.0	*36.661 **63.182	0.001*
Translation line for the heel stick sample	124	82.7	135	90.0	128	85.3	*30.240 **51.702	0.001*
Causes for the heel stick sample are invalid	108	72.5	135	90.0	122	81.3	*33.019 **70.123	0.001*
Samples are transferred from units to the district	132	88.0	138	92.0	135	90.0	*33.429 **77.3.8	0.001*
Action taking toward the positive samples	104	69.3	134	89.3	118	78.7	*33.480 **58.904	0.001*
Storing the filter paper in the unit before taking the sampling	84	56.0	135	90.0	126	84.0	*38.817 **66.543	0.001*
Heel stick samples sent to the district from 1 o'clock to 3 o'clock	103	68.7	133	88.7	122	81.3	*26.510 **61.715	0.001*
Save the information about positive results in the rural health units' records	50	33.3	131	87.3	121	80.7	*40.796 **70.343	0.001*

Paired test (1) paired test (2).***

Figure (II): Frequency distribution of nurses according to total correct   knowledge regarding newborn heel stick test , congenital hypothyroidism and phenylketonuria pre, post, and follow- up newborn screening program (n=150).
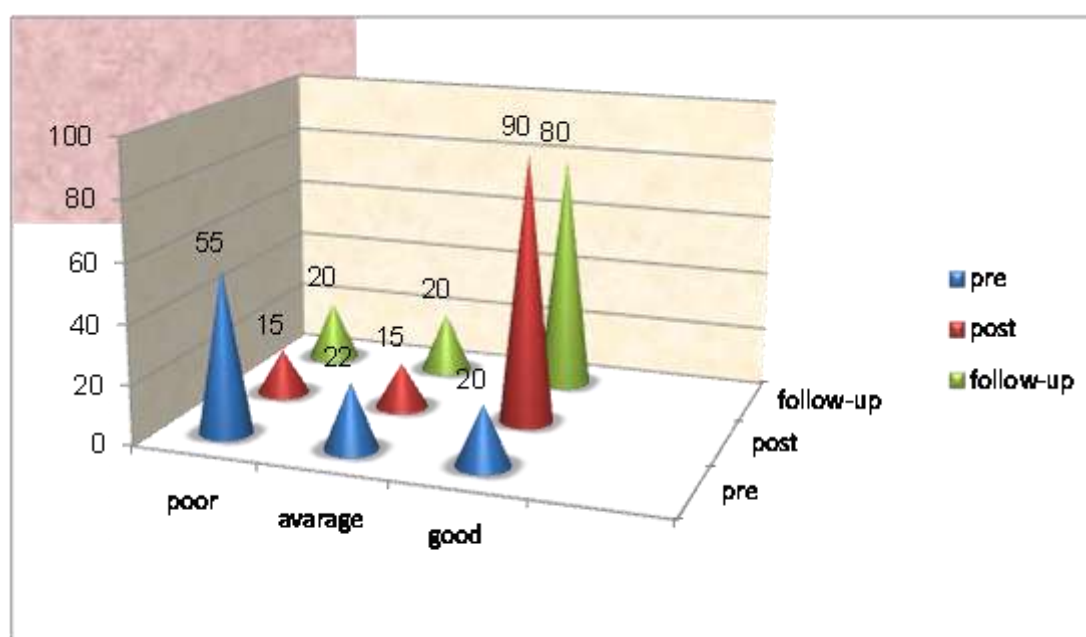

Tabl e

(6): Observation check list to assess nurses done practices pre, post and follow- up program regarding newborn preparation (no=150).

Done practices	Pre-program		post -program		Follow-up		Paired t test	P value
	No	%	No	%	No	%		
3-Newborn preparation								
Ensure the newborn is breast feeding before taking the sample	14	9.3	144	96.0	132	88.0	36.779* 70.690**	0.001*
Ensure newborn's age (3-7 days).	112	74.7	133	88.7	130	86.7	*35.540 **66.970	0.001*
Warmth the baby heel for three minutes	50	33.3	131	87.3	121	80.7	*40.796 **70.343	0.001*

Paired test (1) paired test (2).***

Table (10) Relation between total knowledge and total Done practice (n=150).

Variable	Total Knowledge (n=150)	
	r	P
Total practice	0.44	<0.001**

r-square=0.56   Model ANOVA: F=42.22, p<0.001

DISCUSSION

Part II: Regarding to research hypotheses I *:* health educational program will improve staff nurses **knowledge** regarding newborn heel stick test*:*

The present study showed that, statistical significant improvement in nurses' knowledge level at the post health educational program- test, than that of pre and follow up –test in all knowledge items, P = 0.001.the present study results are on the same line with study done in Macedonia by **Anastasovska and Kocova. (2016)**, about" newborn screening for thyroid-stimulating hormone as an indicator for assessment of iodine status in the republic of Macedonia. " who reported that, after the training program about newborn screening nurses' knowledge improved from poor and average knowledge to good knowledge. also, agreed with study done in Turkey by **Gokulu (2016)**, about" comparative heel stick study showed that newborn infants who had undergone repeated painful procedures showed increased short-term pain responses " who reported that, more than three quarters of the nurses had poor knowledge, which improved to the majority of them had good knowledge after program implementation and this finding agree with the study that done in Hong Kong by **Chloe**, **and et al (2018)** about "the first pilot study of expanded newborn screening for inborn errors of metabolism and survey of related knowledge and opinions of health care professionals in Hong Kong" who reported that, 73.6% of 210 nurses were unaware of the newborn screening program, the majority of study sample (87.6%) that better knowledge regarding newborn screening after program implementation. also, this finding agree with the study that done in USA by**Deluca (2017)** about "public attitudes toward expanded newborn screening" who reported that, most study participants lacked general knowledge about current newborn screening, however, they supported expanding screening for severe and in some cases untreatable conditions. most participants were enthusiastic about expanding newborn screening; however, those

with more years of education were cautious regarding extensive costs of diagnosing and treating rare disorders.

The researcher opinion, these similarities might be due to lack of training program about newborn heel stick. also this results agree with study done in Nepal by ***Shresthaand et al,(2013)***,about '' Newborn care in Nepal: the effects of an educational intervention on nurses' knowledge and practice '' who reported that, there was a significant difference in the pre-test score between immediate post-test, 1-month

post-test and 3-month post-test .there were increased knowledge scores after the intervention compared with pre-test scores, These results indicate that the educational intervention had a positive effect on the participants' knowledge score.

Total correct **knowledge** regarding newborn heel stick test , congenital hypothyroidism and phenylketonuria pre, post, and follow- up newborn screening program.

The present study showed that, nurses' total correct knowledge score about newborn heel stick, congenital hypothyroidism and phenylketonuria, it was found that before program implementation 55% of nurses had poor knowledge score. On the other hand 90% of nurses had good knowledge score at post health education program and 80% of nurses had good knowledge score at follow-up newborn heal stick health education program. are on the same line with study done in Hong Kong by ***Chloe***, ***and et al (2018)*** about "the first pilot study of expanded newborn screening for inborn errors of metabolism and survey of related knowledge and opinions of health care professionals in Hong Kong" reported that, all his study sample lack knowledge about newborn heel stick .In addition this study in the same line with study done in Minia by ***Mohamed and et al (2019)***, about" Effect of educational program on pediatric nurses' knowledge and practice regarding selected non-pharmacological techniques to relive pain in neonates" who showed that,

after program implementation, the post-test had shown highly statistically significant differences in the nurses' total knowledge scores(P.<0.001) compared with the pretest phase of all nurses and that reflects the impact of conducting the educational program.

Regarding to research hypotheses: health educational program will improve staff nurses done **practice** regarding newborn preparation**:**

The present study reported that, there were statistical significant improvement in nurses' done practice level at the post and follow up health education program than that of pretest regarding ensure the newborn is breast feeding before taking the sample this results similar to study donein Egypt by *Fouad and AbdElmoneem, (2016)*, who reported that, breastfeeding provides superior analgesia to oral sucrose in term neonates during heel stick.

The present study reported that , there were statistical significant improvement in nurses' done practice level at the post and follow up health education program than that of pre-test regarding ensure newborn's age (3-7 days), this results similar to study done in Scotland by *Mansour and et al (2017)* about "trends in Scottish newborn screening programe for congenital hypothyroidism 1980–2014: strategies for reducing age at notification after initial and repeat sampling" who reported that, all infants in Scotland are now tested within the Scottish standard of 3–7 days, with median age at first sampling falling to 5 days. In the researcher's opinion, this suitable time for early detection of newborn errors of metabolism.

The present study showed that, statistical significant improvement in nurses' done practice level at the post health education program than pre follow up - test regarding warmth the newborn heel for three minutes, this result was in accordance with study done in Switzerland by *Fontana and Seeger, (2012)*about" when a routine nursing procedure goes wrong: critical incident in a preterm infant" reported that, pre-warming the heel to increase blood flow is often used to prepare for a heel stick with the assumption that this procedure would facilitate blood sampling and therefore reduce the infants' pain. in addition agree study done in USA with *by Cong, (2015),*who studied" heel stick test for obtaining blood samples in neonates: both swaddling and heel warming may help, but heel warming appears to provide greater pain reduction" who reported that, neonates have a significant decrease in pain perception when heel warming is used during heel stick procedures. also this study agree study done in South Carolina by *Williams and et al (2017)* about " newborn screening for Sickle cell disease in St. Vincent and the Grenadines: results of a Pilot newborn screening program " who

reported that, the infant heel warmer, used routinely in neonatal care settings, is an instant heat pack. It increases capillary circulation in an infant's heel to facilitate blood collection by heel stick.

Relation between total **knowledge** and total **practice:**

This table shows that, there was astatically significant between total knowledge and total done practice for newborn heel stick. these finding agree with study done in Ontario by ***Hayeems, (2013)***, the study indicated a positive significant correlation between nurses' knowledge and done practice , and agree with study done by ***Tluczek et al. (2010)***, who reported that there was a significant relation between the total knowledge and done practice scores. Also these results agree with study done in Nepal by ***Shresthaand et al, (2013)***, about '' Newborn care in Nepal: the effects of an educational intervention on nurses' knowledge and practice '' who reported that, there was a positive correlation among the participants' knowledge and practice and those nurses who used their new knowledge in their practice. Nurses who had more knowledge were competent in their practical field during the care of the newborn baby. And the result is similar to ***Abdella, (2015),*** who found that there was statistical significant relation between nurse's practice and their total knowledge score. In addition, this results agree with study done inMinia by ***Mohamed and et al (2019)***, about" Effect of educational program on pediatric nurses' knowledge and practice regarding selected non-pharmacological techniques to relive pain in neonates" who showed that the highest strong positive statistical significant correlation was found between the total scores of knowledge and practice of nurses.

In the researcher's opinion, when nurse have basic of knowledge and adequate training, they become able to give higher done practice.

CONCLUSION

Based on the results of the current study and research hypothesis it can be concluded that:

The result of the study supported the hypothesis of the study: there was an improvement in nurse's knowledge score regarding newborn heel stick, congenital hypothyroidism and phenylketonuria in the rural health units at the post and follow up, than that of pre –test with statistical significant.

Additionally, improvement in nurse's total done practice score regarding newborn heel stick, newborn preparation, take heel stick sample and after taken the heel stick sample in the rural health units at the post and follow up, than that of pre – test with statistical significant.

Recommendations

Based on the study findings of the present study, the following recommendations are proposed:

1. Developing continuous training program for nurses of the rural health units about newborn heel stick.

2. Inform nurses and mothers about important of newborn heel stick and referral places for positive results.

3. Further research:

   - Improving nurses education program about the newborn heel stick in the Egypt.

REFERENCES

1. Anastasovska and Kocova(2016) Newborn Screening for Thyroid-stimulating Hormone as an Indicator for Assessment of Iodine Status in the Republic of Macedonia.

2. Deluca, ., Linda ,L., and Edward, R. (2015)screening: Empowering nurses to improve quality and safety, time 7:00, date 27/10/2018.

   https://www.marchofdimes.org/nursing/modnemedia/othermedia/articles/art03_newborn_screening_improve%20quality_safety.pdf

3. El-Dakhakhny, A. (2011):Impact of an Educational Program on Nursing Care of Neonates with Congenital Hypothyrodism , Journal, Volume 8, Issue 1, time 9;10pm. date 28/12/2018

   http://www.lifesciencesite.com

4. Gokulu., Bilgen., Ozdemir., Sarioz., Memisoglu., Gucuyener., Ozek., (2016);Comparative heel stick study showed that newborn infants who had

undergone repeated painful procedures showed increased short-term pain responses, 1-4-2019,time9:20 pm.

5. Hannon, H.(2013):The newborn screening Story,20/12/2017, time 8:15PM.

   https://www.aphl.org/aboutAPHL/publications

6. Health Grades Inc.,(2014):Statistics by Country for hypothydism,.All rights reserved. Last Update: 13 August, 2016, time 9.53 pm http://www.rightdiagnosis.com/c/congenital_hypothyroidism/stats-country.htm#extrapwarning.

7. Hayeems ., (2013); Primary care role in expanded newborn screening. 1-4-2019,time8:50pm https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3743702/

8. Holaday, B., (2016): Newborn Screening in the Genomic Era, 23-4-2019,time7:25pm
   https://www.researchgate.net/publication/311571063 Newborn Screening in the Genomic Era

9. Schleicher,P and Schuell,O., (2012):Specimen Quality Examples. Washington state department of health, The New York State Department of Health, New Hampshire 03431, 14/11/2016, Time 9,38 pm.

   http://www.doh.wa.gov/YouandYourFamily/InfantsChildrenandTeens/NewbornScreening/Resources/SpecimenQualityExamples

10. Washington State Department of Health. (2016): Newborn Screening Program, 25-4-2017, time 5:25pm. www.doh.wa.gov/nbs

11. Williams., Browne., Smart ., Morella ., Reed., Kanter .,(2017); Newborn Screening for Sickle Cell Disease in St. Vincent and the Grenadines: Results of a Pilot Newborn Screening Program, 1-4-2019, time 8:40 pm.