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Safety Measures Program for Prevention of Occupational Hazards among New Graduate Bachelor Nurses

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Abstract
Background: *The working environment of New Graduate Bachelor Nurses is no exception. The nature of their work is a potential source of many types of occupational hazards, which might consequently lead to health problem. Occupational safety at the work improves new graduate bachelor nurses health and increases their productivity.* ***Aim:*** *the study aimed to evaluate effect of safety protective program regarding occupational health hazards for new graduate bachelor nurses.* ***Research Design:*** *A quasi-experimental design was used to carry out this study.* ***Setting:*** *The study was conducted in medical, surgical departments and outpatient clinics at Benha University Hospital, Qaluobia Governorate, Egypt.* ***Sample:*** *All new graduate bachelor nurses (60).* ***Tools:*** *Two tools were used in this study. First tool: A Structured interview questionnaire included two parts first part: new graduate bachelor nurses ' personal characteristics, and second part: consisted of (50) questions to assess new graduate bachelor nurses ' Knowledge about safety protective measures regarding occupational hazards. Second tool: new graduate bachelor nurses ' observational checklist; consisted of (56 items) to assess new graduate bachelor nurses ' practices of safety protective measures regarding occupational hazards.* ***Result:*** *The study findings revealed that there was statistical significance improvement in new graduate bachelor nurses ' knowledge 43.766 ±3.021 & 34.0±3.188 at immediate post and follow-up program respectively. New graduate bachelor nurses has good level of practices at immediate post and follow-up the program89% & 83% in comparisons to pre-program was poor level.* ***Conclusion:*** *The study concluded that there was statistical significant improvement in new graduate bachelor nurses ' knowledge and practices after implementation the program. Also there were statistical significant positive correlation between new graduate bachelor nurses ' knowledge and practices. Additionally, there was statistically significant positive relation among new graduate bachelor nurses ' knowledge and their age and previous program; also there was statistically significant positive relation between new graduate bachelor nurses ' practices and their gender and marital status.* ***Recommendation:*** *Continuous educational safety protective programs regarding the occupational health hazards for NGBN in medical, surgical departments and outpatient clinics at Benha University Hospital.* ***Key words: Safety measures program, Prevention, Occupational Hazards, and New Graduate Bachelor Nurses****.*

I. Introduction

Nursing is a profession that frequently overlooks its own needs because it is so preoccupied with caring for others. Workplace accidents influence the health care organization by raising expenditures through medical expenses, lost workdays, and workers' diminished capacity to perform services. Due to the nature of nursing professionals' daily jobs, they are more likely to be exposed to a wide range of occupational risks than other healthcare professionals, such as the theater invasive procedures, positioning, turning, walking patients. Unsafe working conditions may result in a high worker loss rate, which increases employer financial losses from hiring more workers and skill loss. Promoting occupational safety and health reduces these losses **(Amukugo, Amakali, & Sipa, 2015; Adelosoye et al., 2016)**.

Health care providers are considered one of the largest work forces worldwide; it composes more than 12% of the working individuals over the entire world **(Goniewicz et al., 2012)**. Over million of the health care workers are subjected to dangerous substances and workplace mishaps. Every year, there are around one million work-related fatalities and 250 million occupational accidents. In developing countries, the situation is getting worse because of factors including the number of workers who incur injuries each year, a lack of education, poor medical facilities, a lack of accurate information, and illiteracy at the workplace hazards. Occupational hazards are

the tenth leading cause of diseases and death at work place. Nursing and residential care facilities were among the top 10 industries in the country with the third-highest rates of occupational illnesses and nonfatal injuries. Due to their physically demanding jobs and the conditions in which they work, nurses are particularly vulnerable to workplace accidents **(WHO, 2009; Perhats et al., 2012; Faremi et al., 2014)**.

Occupational hazards refer to workplace activities, material, substance, process or condition that have the potential to surge the risk of ill health or injury. Also it's can be arising from one's employment. Occupational health hazards are the anticipated dangers to a person's health and safety associated with their work environment. **(WHO, 2009; Galougahi, 2010; and Rajan, 2014)**. The occupational hazards were classified as biological and non-biological. The biological hazards include wounds, cuts, sharp related injuries, and direct contact with infected specimens/bio hazardous materials, and nosocomial infection. Also, biological hazards include all types of microorganisms as well as exposure to plants, animals, and parasites, and exposure to biological hazards is through contaminated water or food, improper waste management, improper food handling, unsanitary work environment in addition to unsanitary personnel practice **(Sikiru & Hanifa, 2010; Yassi & Lockhart, 2013; and Aly, 2015)**.

The non-biological hazards were including physical/ergonomic, chemical, and psychosocial hazards. The physical/ ergonomic such as radiation, noise, light, temperature, ventilation and pressure extremes, finally, the ergonomic hazards are related to design of tools, improper lifting, poor position and work design and work environment. Chemical hazards are numerous and include vapors, gases, solids, dusts and disinfectants. **(WHO, 2009; Orly, 2012; Stanyar, 2014; Aly. 2015; Bazeyo et al., 2015)**. **(Burdorf & Ijzelenberg, 2014; and Eljedi, 2015)**. **(Branco et al., 2010; Sarafis et al., 2016).** In underdeveloped nations, where employment dangers are more severe, occupational hazards are quite widespread. Moreover, 95% of nursing practitioners are found to be exposed to workplace risks. Additionally, there may be up to 250 million occupational injuries and 330000 fatalities each year. Around the world, there are about 160 million new cases of occupational sickness each year. Moreover, Sharp injuries are one of the occupational risks that healthcare workers are subject to. Around 2 million HBV, 900,000 HCV, and 170,000 HIV infections among healthcare workers are caused by medical sharps injuries each year globally **(Hassan, 2005; WHO, 2006; Dropkin et al., 2013; & Hassan, 2014)**

The expectations on a nurse's high level of expertise and capacity to work collaboratively as a member of the healthcare team make the nursing practice setting frequently quite complex. For the NGBN, this environment may be daunting. The NGBN usually begin the process of professional role transition once they formally leave their nursing education program. All NGBN are impacted by the transition from student to nurse, which is a serious issue **(Duchscher, 2012; Karahan, Toruner, Abbasoglu, & Ceylan, 2012; Kuokkanen et al., 2016)**. Student nurse after passing the board exam become registered nurses and when a student nurse graduates and begins work as a nurse, they experience a wide range of emotions. They initially feel happy and proud about accomplishing a goal. Once they start working as nurses, these feelings may change to feelings of inadequacy, skill insecurity, and occasionally even fear of making the wrong decision **(Karahan et al., 2012; and Reimche, 2017)**.

The following are some of the factors and obstacles that have an impact on safety precautions and interfere with the provision of safe care: Absence of role model, and the excessive workload or lack and unavailability of sinks. Additionally, hazards and risks might results from poor supervision, lack of time and knowledge, forgetfulness, lack of means, adverse impact of the equipment on nursing skills, difficult equipment, and absence of training, insufficient experience on the job, conflict between self-protection and the need to provide care and distance to vital/essential supply, facility, or equipment **(Hassan, 2005; Aliyu & Auwal, 2015; Aly, 2015; Amadhila et al., 2017)**.Several protective measures must be taken to reduce exposure to occupational hazard. Engineering control methods that aim to change or get rid of the exposure source, include the provision of safer needle-stick devices and needle disposal containers and designing spaced place with high efficiency ventilation. Also safety protective measures such as hand washing, good hygiene, and utilization of lifting assistive devices, work place monitoring, vaccination, uses of protective equipment and clothes as gloves, mask, gown, and eye protection, .. etc. **(Faremi et al., 2014; Fletcher et al., 2015; Ndejjo, Musinguzi, & Yu, 2015; Aluko et al., 2016).**

The significance of the study

The hospitals as any other productive business give rise to an enormous amount of risk. The largest category of healthcare employees is NGBN, and they are more likely than other healthcare workers to be exposed to occupational hazards at work, where nurses may care for individuals with infectious disease **(Awan et al., 2017)**. The NGBN face much stress that are related to limited knowledge, immature interpersonal relationships, lack of social experience, and lack of competence. Moreover, ergonomic factors predispose them to low back pain and workplace violence. Workplace hazards have an impact on not only the employees but also the organization as a whole due to its effects on wage loss, medical expenses, disruption of the workplace, loss of productivity, high absenteeism rates, low employee morale, and job loss **(Isara and Ofili 2012; Karahan et al., 2012; Stanyar, 2014; Aly 2015).**

Additionally, from researchers' observation when contacted with NGBN in different clinical training departments. It was observed that most of absenteeism days/sick leave due to their exposure to occupational hazards. Also, NGBN spend extra time at work, so safe healthy workplaces are crucial. The key elements of protection from occupational hazards are training and educating NGBN about their role, types of occupational hazards, and protective safety measures practice that can be used in the healthcare sector to lessen the likelihood of exposure to certain occupational hazards and decrease the burden of occupational disease among health care workers. So, NGBN needed to prepared and oriented effectively to increase their knowledge and practice regarding safety measures in dealing with occupational work hazards

Aim of the study

The study aims to evaluate effect of safety measures program for prevention of occupational hazards among new graduate bachelor nurses through:

1. Assessing NGBNs' knowledge toward safety measures for prevention of occupational hazards.
2. Assessing NGBNs' practice toward safety measures for prevention of occupational hazards.
3. Designing and implementing safety measures program for prevention of occupational hazards among NGBN.
4. Evaluating the effect of safety measures program for prevention of occupational hazards among NGBN.

Research hypotheses

1- There will be general improvement in the NGBNs' knowledge and practice toward safety measures for prevention of occupational hazards after implementation of the program. 2- Also there will be a positive correlation between NGBNs' knowledge and practice after implementation of program.

The Subjects and Methods Research Design

A quasi-experimental design was used to carry out the present study.

Setting:

The study was conducted in the medical-surgical departments and outpatient clinics at Benha University Hospital Qaluobia Governate, Egypt, according to hospital needs additionally; the patients' numbers in these departments are more than other departments.

Sample

All New Graduate Bachelor Nurses. They are working from less than one year as 30 of them working in medical units, 21 of them working in surgical units and 9 working in outpatient clinics (total sample size was 60 nurses)..

Tools of data collection

Two tools were used to collect the study data:

The First Tool: A structured questionnaire developed by the researchers through review of relevant literature **(International Labour Organization, 1999; Osborne, 2002; Hassan, 2005; He et al., 2010; Amosu et al., 2011; Gao, 2011; Wube, 2011; Hassan, 2014; Aly, 2015)**, It included two parts: *Part one*; NGBNs' personnel characteristics as (age, gender, marital status, grade score, department, years of experience, and previous training). *Part two;* knowledge test in order to assess NGBNs' knowledge toward occupational hazards predisposing factors, and different methods of protection from these hazards. It consisted of (50 questions). These questions were categorized into 6 six main dimensions: 1-Accidental hazards (8 questions), 2-physical hazards (10 questions), 3-chemical hazards (8 questions), 4-infectious /biological hazards (8 questions), 5psychological hazards (8 questions) and 6-social hazards (8 questions).

The scoring system:

The question was scored as "1" for correct answer, and "zero" for incorrect answer. The total scores were "50", and knowledge was considered correct or satisfactory if the percent was 60% or more and unsatisfactory if less than 60%.

The total score:

- Satisfactory ⟶ ≥60% that equals ≥30 marks
- Unsatisfactory ⟶ < 60% that equals 1-29

Second Tool: NGBNs' Observational Checklist

An observational checklist developed by the researchers through review of related literature **(WHO, 2009; Hassan, 2005; He, et al., 2010; Wube, 2011; Foley & Leyden., 2014; Aly, 2015; Eljed, 2015)**, to assess NGBNs' practice toward safety measures for prevention of occupational hazards through observing of NGBNs' compliance to safety protective measures. That consisted of (56 items) grouped under the following seven main categories as follows: 1- Personnel hygiene and hand washing (8 items), 2- Wearing protective clothes (8 items), 3- Dealing with sharp instruments and equipment (8 items), 4- Avoiding muscles skeleton system problems

"Body mechanics/ safe movement when lifting" (8 items), 5- Recording and reporting for decreasing work stressors and avoiding exposer to violence (8 items), 6- Biological safety "Waste management" (8 items), 7- Reviewing and following special regulation and safety measures (8 items).

Scoring system:

The subjects' responses were scored against three point Likert Scale. "Not done" as (0), "incompletely done" as (1), and "done completely" as (2). Mean and standard deviation was calculated and then converted into percentage.

- Good practice when total percentage is ≥75% that equals between ≥ 84-112 scores
- Average practice when ranged from 60% - <75% that equals between 68- 83 scores.
- Poor practice when percentage is < 60% that equals 0-67 scores.

Tool validity and reliability

Validity: Five specialists in the fields of community health nursing, nursing administration, and medical-surgical nursing from the Faculty of Nursing at Benha University evaluated each tool used in the current study to guarantee its clarity and application.

Reliability: The Cronbach's Alpha Coefficient test was used to determine the reliability, and it showed each tool to have a moderate to high reliability level. The first tool's internal consistency was 0.876, whereas the second tool's was 0.857.

The pilot study

Ten percent of the (6) NGBN study sample were used in a pilot study to gauge the tools' clarity, objectivity, and viability as well as to calculate how long they would take to complete. At the end of October 2017, it was completed. The primary study sample was drawn from the pilot study.

Field work

- Following an explanation of the study's objectives, the Directors of the Benha University Hospital received a written official letter from the Dean of the Nursing Faculty at Benha University requesting their approval for conducting the study
- The study was taken approximately 11 months; the study was started at the beginning of July 2017 to the end of May 2018.

The preparation phase

- In order to build and construct the study tools for data collecting and prepare for a safety protective programme, the researchers analysed recent related literature and theoretical understanding of the many factors that pertain to the study's issue. Translating tool into Arabic language to facilitate better understanding and introduced to NGBN in two forms Arabic and English format
- Development of the program was based on context of the needs were identified through baseline data from final designed tools. Additionally, the development of the program based on assessment of nurses' knowledge and practice that was done directly before starting the program.
- Staring in preparing and designing of safety measures program to provide NBGN an opportunity to develop their knowledge and practice about safety protective measures for prevention of occupational hazards, it was done through assessment, implementation, and evaluation phase.

Assessment Phase

- When the researchers met with the NGBN, they described the purpose, methodology, and nature of the study. Individually or in group sessions, this was done. Additionally, the NBGN were divided into six groups, each including ten NBGN, according to their department location.
- In order to get their support and ensure the continuity of patient care, the researchers distributed the questionnaires to the participating NGBNs before implementing the programme during the period of November 2017. They were instructed to complete it during their work hours (morning and afternoon shifts), which were previously determined with the head nurse of each unit according to the type of work and their workload. After that the researchers were observe NGBNs' practice regarding safety protective measures for prevention of occupational health hazards.

The planning and Implementation Phase

Planning phase: The researchers created the guidelines' content after reviewing the relevant literature, sample attributes, and the assessment phase's findings. **General objective:** The general objective of the safety protective program was to improve knowledge and practice regarding occupational health hazards. The safety protective program **content includes** the following items; definition of occupational work hazards and its types, contributing factors of occupational work hazards, safety protective measures about occupational work hazards, and nursing practice during application of protective safety measures.

- The program was implemented in previous mentioned units at Benha Univerity Hospital. It was implemented during the period of January 2018. The time needed for achieving the program objectives was 30 hours 18 hours for practical and 12 hours for theoretical. The educational program lasted for 15 days with 30 hours distributed as the following; 15 sessions, 2 hour/session, 2 days/week.
- Each researcher executed the safety measures programme with a single group independently throughout the day by making use of the resources at their disposal, pertinent information, and teaching techniques for each session. Lectures, small-group discussions, brainstorming, role-playing, group activities, and practise sessions were among the variety of instructional techniques used. Powerpoint presentations and handouts created by the researchers and sent to all NBGNs on the first day were utilised as instructional material and teaching aids.
- Feedback was given at the beginning of each session about the previous one and at the end of each session about the current sessions, and different methods of evaluation were selected to suit the NGBNs' needs and achieve objectives and contents of the safety protective program.

The evaluation phase

- Evaluation of the program was done by the same pretest tools. A pretest was conducted prior to the sessions. Purposes and nature of the study was explained to NGBN before answering the pretest, which filled by them in the presence of researchers. A post test was administered also both immediately after implementation of the program and three months later.
- The evaluation phase emphasis on assessing the effect of the program on NGBNs' knowledge and practice about safety measures regarding occupational hazards through self-administered questionnaire and observational checklist. The data were collected immediately post and follow-up program after three months of program implementation, to determine the level of improvement, and to assess the retained acquired knowledge and practice through comparison of the results of pre, post and follow-up test.

Ethical considerations

- Before beginning the data collection, each NGBN was given an verbal consent form and informed of the goals and advantages of the study. The study's confidentiality was maintained at all times. The NGBN were given the assurance that all information was utilised solely for research purposes and that they each had the freedom to decline or withdraw from the study at any time.

Statistical analysis

Data were verified prior to computerized entry. The Statistical Package for Social Sciences (SPSS version 20.0) was used for that purpose, followed by data analysis and tabulation. Descriptive statistics were applied (e.g., frequency, percentages, mean, and standard deviation). Test of significance (Chi-square and independent t test) were used to test the homogeneity of the outcome variables between the groups and to test the study hypothesis. Pearson correlation coefficients were used. A statistically significant difference was considered at P-value $P \leq 0.05$, and a highly statistically significant difference was considered at P-value $P \leq 0.001$.

II. Results:

Table (1): Personnel characteristics of the new graduate bachelor nurses NGBN. (N=60)

Personnel characteristics	Total (N=60)	
	N	%
Department / unit Medical	**30**	**50%**
Surgical	**21**	**35%**
Outpatient	**9**	**15%**
Age ≤ 24 Years	**29**	**48.3%**
25 Years	**23**	**38.3%**
26 Years	**8**	**13.3%**
Mean and S.D	**24.66±0.704**	
Gender Male	**18**	**30%**
Female	**42**	**70%**
Marital status Single	**41**	**68.3%**
Married	**19**	**31.7%**

Years of experience 1-< 6months	**48**	**80%**
6-12 months	**12**	**20%**
Grade Score Excellent	**22**	**36.7%**
Very Good	**29**	**48.3%**
Personnel characteristics	**Total (N=60)**	
	N	**%**
Good	**9**	**15%**
Education before joint nursing collage High Secondary school	**39**	**65%**
Associated nursing institute	**21**	**35%**
programs in occupational Hazards and safety measures Yes	**17**	**28.3%**
No	**43**	**71.7%**

Table (1): This table shows that 50 % of NGBN were in medical department, while 15% of them were in outpatients. Also 48.3% of them were ≤24 years old, while 13.3% their age were 26 years old. In addition to 70% & 68.3% of them were female and single respectively. As regarding to their year of experience 80% of NGBN have less than six months of experience, and 48.3% of them have very good score, while 15% have good score. And 65% of them have high secondary school. And 71.7% of NGBN haven't any program in occupational hazards and safety measures.

According to research hypothesis No. 1- There will be general improvement in the NGBNs' knowledge and practice toward safety measures for prevention of occupational hazards after implementation of the program.

Table (2): The mean difference scores of the new graduate bachelor nurses' knowledge toward occupational hazards and its safety measures. Pre, post and follow-up program (N=60).

The occupational hazards knowledge dimensions	Maximum Score	Pre-Program		Post-Program		Follow-up		F Test	P Value
		X	±S.D	X	±S.D	X	±S.D		
Accidental hazards	**8**	**2.100**	**±1.100**	**7.166**	**±0.806**	**5.533**	**±1.126**	**384.608**	**0.001**
Physical hazards	**10**	**1.700**	**±0.944**	**8.683**	**±0.676**	**6.716**	**±0.903**	**107.78**	**0.001**
Chemical hazards	**8**	**2.000**	**±0.823**	**6.850**	**±0.860**	**5.583**	**±1.183**	**404.263**	**0.001**
Infectious/biological hazards	**8**	**2.333**	**±0.895**	**6.900**	**±1.084**	**5.533**	**±0.982**	**335.949**	**0.001**
Psychological hazards	**8**	**1.4167**	**±0.944**	**7.050**	**±0.648**	**5.833**	**±1.122**	**614.874**	**0.001**
Social hazards	**8**	**1.950**	**±1.213**	**7.116**	**±0.940**	**4.833**	**±0.977**	**364.404**	**0.001**
Total Knowledge	**50**	**11.50**	**±3.500**	**43.766**	**±3.021**	**34.0**	**±3.188**	**105.63**	**0.001**

(A statistical significant difference P ≤ 0.05 and A highly statistical significant difference P ≤ 0. 001)

Table (2): Finding of the table illustrates that there were highly statistical significant improvement in NGBNs' knowledge toward occupational hazards after intervention both immediately post and follow up program, the total mean scores of NGBNs' knowledge was low 11.50 ±3.500 at pre-program and it improved and increased to 43.766 ±3.0217 & 34.0 ±3.188 at immediately post and follow up program respectively.

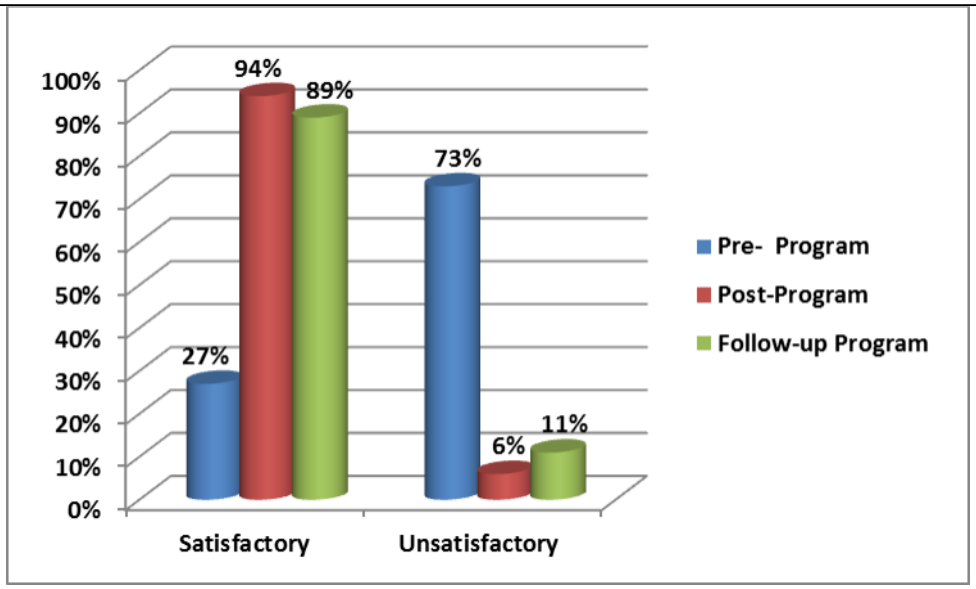

Figure (1): The new graduate bachelor nurses' total level of knowledge toward occupational hazards and its safety measures. Pre, post and follow-up program. (N=60).

Figure (1): This figure shows that, that there was statistical general improvement in total level of NGBNs' knowledge after intervention of the program both immediately post and follow-up after three months of the program. In the pre-program; 73% of NGBNs' knowledge was unsatisfactory; while in the immediate post and follow-up it was improved and increased to 94% & 89% and became satisfactory respectively. **According to research hypothesis No. 1- There will be general improvement in the NGBNs' knowledge and practice toward safety measures for prevention of occupational hazards after implementation of the program.**

Table (3) : The Differences of the new graduate bachelor nurses' practice toward safety measures. Pre, post and follow-up program (N=60).

Items / Program Phases	Pre			Post			Follow-up			X^2	P value
	Poor	Good	Average	Poor	Good	Average	Poor	Good	Average		
The personal hygiene and hand washing	0%	11.7%	88.3%	66.7%	10%	23.3%	15%	26.7%	58.3%	82.606	0.001
Wearing protectiv e clothes (mask,	0%	8.3%	91.7%	66.7%	10%	23.3%	58.3%	18.3%	23.3%	72.846	0.001
with Dealing instruments and sharp equipment	0%	3.3%	96.7%	68.3%	15%	16.7%	20%	25%	55%	94.309	0.001
Avoiding muscle skeleton system	0%	8.3%	91.7%	59.3%	16.9%	23.7%	23.3%	20%	56.7%	65.564	0.001
Reporting & recording for decreasing work stressors and exposer to violence	0%	13.3%	86.7%	51.7%	18.3%	30%	26.7%	15%	58.3%	47.695	0.001
Biological safety (waste management)	0%	5%	95%	58.3%	15%	26.7%	20%	28.3%	51.7%	75.417	0.001
Reviewing & following special regulation and safety measures	1.7%	6.8%	91.5%	70%	10%	20%	56.7%	26.7%	16.7%	88.604	0.001

(A statistical significant difference P ≤ 0.05 and A highly statistical significant difference P ≤ 0. 001)

Table (3): Finding of this table exhibits that there were highly statistical significant differences and general improvement in NGBNs' practice toward safety measures for prevention of occupational hazard at both immediate post and follow up as compared to pre-program. The highest percentages 91.7% & 91.5% of NBGNs

had poor practice in relation to wearing protective clothes (mask, gloves, eye covering), reviewing and following special regulation and safety measures respectively at pre-program, while after implementation of the program both immediately post and on follow-up after three months it was improved and became good 66.7% & 70% respectively at immediately post, also it was slightly decreased to 58.3% & 56.7% in follow-up program respectively but still more than pre-program.

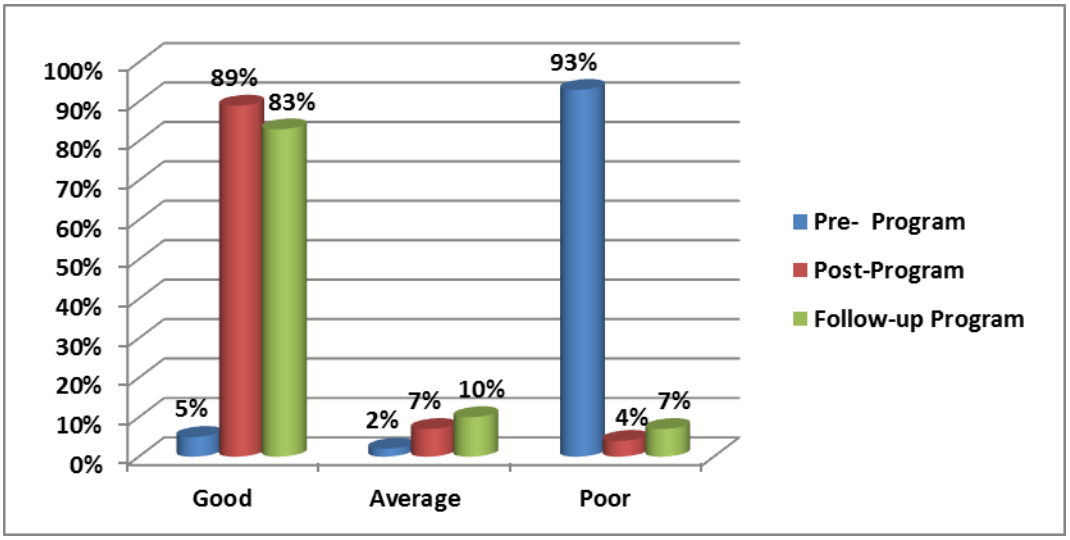

Figure (2): The new graduate bachelor nurses' total level of practice toward safety measures. Pre, post and follow-up program. (N=60).

Figure (2): This figure indicates that there was general improvement in total level of NGBNs' practice after intervention of the program at both immediately post and follow-up as compared to pre-program. The 89% & 83% of NGBN had good level of safety measures for prevention of occupational hazards at post and follow-up program respectively. However at pre-program the highest percentage 93% of NGBN had poor level of practice toward safety measures.

According to research hypothesis No. 2- There will be a positive correlation between NGBNs' knowledge and practice after implementation of program.

Table (4): Correlation coefficient between new graduate bachelor nurses' knowledge and practice. Pre, post and follow-up program. (N=60).

Knowledge	Practice	
	r	P value
Pre Program	0.709	0.03
Post Program	0.61	0.21
Follow-up Program	0.71	0.41

(A statistical significant difference P ≤ 0.05 and A highly statistical significant difference P ≤ 0. 001)

Table (4): This table reveals that, there was positive statistically significant correlation between NBGNs' knowledge scores and their practice scores. This mean when NGBNs' knowledge is increased their practice toward safety measures is increased and improved.

Table (5) : Relation among new graduate bachelor nurses' knowledge scores and their personnel characteristics. Pre, post and follow-up program (N=60).

Personnel characteristics	New Graduate Bachelor Nurses' Knowledge								
	Pre- program			Post program			Follow-program		
	r	Pvalue	X^2	r	Pvalue	X^2	r	Pvalue	X^2
Department / unit	-0.79	0.548	17.934	0.038	0.774	22.038	0.013	0.923	20.11
Age	0.393	0.002	38.892*	0.96	0.200	21.47	0.035	0.790	21.315
Gender	-0.052	0.691	10.17	-0.039	0.768	13.795	-0.51	0.701	10.238
Marital status	-0.191	0.144	10.86	0.065	0.622	10.58	0.095	0.471	10.86
Years of experience	0.096	0.465	16.424	-0.184	0.160	15.672	-0.005	0.968	10.312
Grade Score	0.088	0.506	30.552	0.235	0.071	21.29	0.073	0.582	27.526
Education before joint nursing collage	0.196	0.133	16.909	-0.071	0.589	27.439	0.103	0.435	13.260
programs in occupational	-0.250	0.05	7.246	0.00	0.998	6.417	-0.159	0.226	13.871

(A statistical significant difference P ≤ 0.05 and A highly statistical significant difference P ≤ 0. 001)

Table (5): This table indicates that, there were statistically significant positive relation among NBGNs' knowledge scores and their age, program in occupational hazards and safety measures. While there weren't relation among NGBNs' knowledge scores and department, gender, marital status, years of experience, grade score, and education before joint nursing collage.

Table (6) : Relation among new graduate bachelor nurses' practice scores and their personnel characteristics. Pre, post and follow-up program (N=60).

Personnel characteristics	New Graduate Bachelor Nurses' Practice								
	Pre- program			Post program			Follow-program		
	r	P value	X^2	r	P value	X^2	r	P value	X^2
Department / unit	0.217	0.096	62.571	-0.064	0.626	74.857	10.116	0.379	61.024
Age	-0.138	0.294	59.729	-0.168	0.200	67.946	-0.156	0.235	62.213
Gender	0.097	0.462	17.450	-0.309	0.016	38.33	-0.229	0.078	44.127
Marital status	-0.284	0.028	36.123	0.154	0.239	32.118	-0.136	0.300	38.049
Years of experience	0.150	0.235	29.792	0.169	0.195	37.083	-0.015	0.907	42.292
Grade Score	0.151	0.251	60.804	0.049	0.712	76.880	0.071	0.590	67.731
Education before joint nursing collage	0.210	0.108	24.469	-0.110	0.403	38.974	0.107	0.417	37.289
programs in occupational hazards & safety measures	-0.173	0.187	23.885	0.089	0.499	36.854	-0.137	0.295	34.966

(A statistical significant difference P ≤ 0.05 and A highly statistical significant difference P ≤ 0. 001)

Table (6): This table clarifies that; there were positive statistically significant relation among NGBNs' practice scores and their gender and marital status. While there weren't relation among NGBNs' practice scores and their department, age, years of experience, grade score, education before joint nursing collage, and program in occupational hazards and safety measures.

III. Discussion

Work is considered a basic part of one's life experience. Each kind of work carries it risks and health hazards. Every occupation has health risks that are the main factor in mortality and death rates.. The working environment of NGBN and other healthcare providers is no exception. Numerous occupational dangers that could be present due to the nature of their profession could eventually result in health issues. Workplace occupational safety enhances the health and productivity of NGBNs **(Hassan, 2005; Zhou, 2010; Rhule, 2012; Aly, 2015; Aluko et al., 2016; Doyle, 2017)**.

The current study findings showed that less than half of NGBN were below the age of 24 years old, while the minority of them age was 26 years old. This may be due to the NGBN graduated in the same age but there was some students failed in their study for one or two years. This finding in accordance with **Bailey, et al., (2016),** who conducted a study on "The impact of adverse events on health care costs for older adults undergoing non elective abdominal surgery", and stated that the majority of studied nurses were with an average age of 22 years or more. This finding was in disagree with **Yuh-Ang, et al., (2016),** who conducted a study entitled "Demographics and personality factors associated with burnout among nurses in a Singapore Tertiary Hospital", and revealed that most of studied nurses were less than 39 years of age.

As regards to gender and marital status, the current study results revealed that two thirds of them were female and more than half of them were married. This may be due to lack of male nurse graduate at Benha University Hospital which resulting from the majority of female studying nursing branches rather than male. This finding is on the same line with that of **Labrague, et al., (2012)**, who reported that majority of the study respondents were female and married. While this finding is in disagreement with **Hayajneh, (2014)**, who conducted a study "Predicting nurses' turnover intentions by demographic characteristics", and showed that more than forty percent of studied nurses were males and more than one half of them were single.

Concerning years of experience, the study findings reveal that, the majority of them have less than six months of experience. These may due to the studied subjects were new graduate nurses and practices for one year at Benha University Hospitals. This finding in the same context of **Labrague et al., (2012)** who studied "Operating room nurses' knowledge and practice of sterile technique", and reported that the clinical experience of most of the respondents had rendered 1 to 2 years of service.

As regards to qualification, the current study results reported that more than half of studied NGBN were secondary school graduate before entering nursing college. This finding reported by **Adejumo and Olatunji, (2013),** when they stated that above 60% of nurses had diploma certificates.

In relation to programs in occupational hazards and safety measures, the findings of this study reveal that about tow thirty of NGBN haven't any programs in occupational hazards and safety measures. This result supported by **Hassan, (2005)**, who conducted a study about " Work related hazards facing nurse interns: A strategy for protection, at Faculty of Nursing, Ain Shams University", and reported that more than three quarters of study sample didn't join any educational program or courses related to work hazards and/or protection. This can be discussed as there was deficient in NGBNs' knowledge and practices so that lack of safety protective measures knowledge and practices could expose them to work hazards and injuries. Similarly, **Wube (2011),** who studied "Assessment of occupational safety and health management system in some federal government organizations, Addis Ababa University, Published Thesis", and demonstrated that around half of the sample does not receive safety and health program which, leads to lack of occupational safety and health policy in place. Also, **Almurr (2013),** who reported that respondents did not take a program regarding safety protective practices. Supporting to these study findings **Spasic, (2010),** who stated that modern surgery requires a group of suitably skilled personnel who able to deal with the demands of their complex work environment and deliver safe care for surgical patient. Opposite to the present study

Regarding knowledge of the NGBN about occupational hazards, there is lack of NGBNs' knowledge before program implementation. This may be due to the need of NGBN in medical- surgical and outpatient area with refreshment knowledge. Supporting to these study findings **Ndejjo, et al., (2015)**, who conducted a study "Occupational health hazards among healthcare workers in Kampala, Uganda", and stated that The majority of registered nurses are unaware of the risks associated with handling sharp objects, lifting patients, and being exposed to airborne infections, among other workplace dangers. The foregoing results in agreement with these results of **Ghosh, (2013),** who stated that evidence suggests that nurses face several workplace dangers, and it appears that there is a paucity of knowledge regarding the causes, prevention, and treatment of occupational injuries and diseases.

Also, **Elewa and El-Banan, (2016),** In their study entitled "occupational hazards as perceived by Nursing-interns and protective measures", published paper, Faculty of nursing, Cairo University, and stated that, regarding contributing factors to occupational hazards, findings of their study showed that most of nursing interns perceived lack of educational and developmental programs for healthcare providers, regular medical exams,

occupational safety regulations and procedures, and efficient supervision are additional elements that contribute to workplace dangers.

The current study findings revealed an improvement in NGBNs' knowledge and had satisfactory level in all items that related to occupational hazards and its safety measures in both immediately post program implementation and but slightly declined in follow up program as compared to pre-program. This may be due to the tendency of the NGBN with no previous work experience to know about the hazards in the beginning of their work life, also frequent assignments during program phases, and repeated evaluation of studied NGBN, and also recent information which may acquire during program implementation. Also the decline in the scores at follow-up could be due to extraneous factor related to educational system that lays importance on recall rather than application, analysis, and synthesis, also the NGBN can't preserve knowledge for long periods of time. Also Knowledge can be influenced by the rate at which information is retained, the capacity for knowledge acquisition, the accumulation of life's lessons learned, and the updating of knowledge while a programme is being implemented. Examples of active learning techniques include work activities, small-group discussions, brainstorming, group activities, etc.

In the same line **Hassan, (2005),** who found on his study that, before program the nurse interns have shown unsatisfactory perception about work related hazards. Similarly, **Aly, (2015),** who conducted a study "Work related hazard among nurses in general hospital" Unpublished Master Thesis, Faculty of Nursing. Ain Shams University, and revealed in his study, that there was a low perception of work related hazards and generally unsatisfactory related knowledge among nurses.

Regarding the NBGNs' practice toward safety measures for prevention of occupational hazards, it was showed that studied NGBN had poor level in practice for prevention of occupational hazards in pre-program. These findings may be related to lack of knowledge, experience, lack of facilities and equipment, inadequate training, and work overloaded, lack of motivation, and lack of self-confidence, and also most of NGBN gained their knowledge about occupational hazards and its safety measures at courses of baccalaureate program and not remembered this knowledge.

These findings supported by **Elrefaee, (2012),** who analyzed nurses' procedures regarding the security of surgical patients undergoing intraoperative general anaesthesia at main University Hospital and reported that nurses' level of safety practices was unsatisfactory regarding studied surgical patients. In this respect to **Hassan, (2005),** who noted that when nurse-interns actually observed in clinical areas after pre-program, the adequacy of performance was lowest in the pre-program phase, also the majority of them had adequate performance in post and follow-up phases.

In addition, most of the NGBNs' had poor practice related to wearing protective clothes (mask, gloves, eye covering), reviewing and following special regulation and safety measures at pre-program. This can be discussed as due to lack of experience and they haven't any training about occupational work hazards and its safety protective measures. These findings were in agreement with **James (2009)**, who studied "Model of surgical wound infection", and clarified that there was poor compliance to aseptic procedure. On the same line, **Jones (2013)**, in a related study discovered that surgical staff demonstrated poor aseptic practice. While the foregoing finding of the present study is incongruent with **Labrague et al., (2012)**, who stated that, majority of studied nurses had good knowledge on the principles of sterile technique. Also, **Hassan, (2005),** who revealed that more than three fourth of nurse interns had adequate performance related to dealing with equipment. Additionally, **Osman, (2003),** in his conducted study " Assessment of doctor and nurses awareness of environmental risks in I.C.U"., Master Thesis, Faculty of Nursing, Cairo University, Egypt and **Aly, (2015),** who stated that the majority of nurses reported adequate safety practice regarding work related hazards.

While after implementation of the program both immediately post and follow-up after three months, the NBGNs' practices toward safety protective measures for prevention of occupational hazards was improved and became good at immediately post. This may be due to the effectiveness of the program, and the use of the training program in the present study has successfully influenced NGBNS' knowledge and practice. Supporting these results **Amukugo, et al., (2015)**, who illustrated that improvement in practices of intern nurses practices following program implementation. In this respect to **Hassan, (2005),** who found that there were statistically significant improvements in nurse interns' attitude and performance after program implementation. In contrary to **Aly, (2015),** who found that the majority of nurses had adequate level of safety practice although they have low level of perception and knowledge regarding work-related hazards.

Regarding Correlation coefficient between NBGNs' knowledge and practice toward safety measures for prevention of occupational hazards throughout study phases**,** the study results revealed that there were statistically significant positive correlation between NBGN' knowledge and practice. Which revealed that when NBGNs' knowledge is increased their practices toward safety measures for prevention of occupational hazards is enhanced and improved. This may be attributed to the good practice is mainly based on adequate and satisfactory knowledge. This finding in agreement with these results **Elewa and El-Banan, (2016)**, who demonstrated that there was

statistical significant relation between total nurses' knowledge scores about occupational hazards their scores towards safety protective measures.

Finally the present study findings illustrated that, there were statistically significant positive relation among NBGNs' knowledge and age, and training in occupational hazards. This because knowledge and skills is increased and improved with time, program and experience all of this increased with age. These results consistent with **Aliyu and Auwal (2015),** who conducted a study "Occupational risks and hazards exposure, knowledge of occupational health and safety practice and safety measures among workers of A Nigerian Bottling Company". Found that, there was a significant association between study subjects knowledge related to occupational hazards exposure and age.

As well**,** there were statistically significant positive relation among NGBNs' practice toward safety measures for prevention of occupational hazards and gender and marital status. This could be due to that the heavy work usually given to male rather than female. These results are incongruent with **Farrokhi, et al., (2010),** who conducted a study "the relationship between knowledge of ergonomic science and the occupational health among nursing staff affiliated to Golestan University of Medical Sciences, and showed that there was no statistical significant relationship between nurses' risks practices and gender. Moreover, **Saqer, (2014),** who conduct a study entitled "Assessment of health and safety risk among health care providers in European Gaza Hospital, Master Degree of Environmental Science", and stated that there is no significant association between the occupational hazards and gender.

IV. Conclusion

According to study results and research hypothesis there was statistical significant general improvement in NGBNs' knowledge and practices after implementing of the program as compared to pre course knowledge and practice. Also there were statistical significant positive correlation between NGBNs' knowledge and practices total scores. There were positive statistically significant relation among NBGNs' knowledge and their age and previous training; also there were positive statistically significant relation among NBGNs' practices and their gender and marital status.

V. Recommendations

The following recommendations are made based on the findings of this study:

- Continuous educational safety protective programs regarding the occupational health hazards for NGBN at medical, surgical departments and outpatient clinics at Benha University Hospital.
- Guidelines, sufficient booklets and posters regarding occupational work hazards and safety should be provided and distributed to all the units/departments periodically, so that all nurses will be able to read it.

Further Research

- Replication of the study on a larger probability sample is highly recommended to achieve generalization of the results.
- Further study must be conducted about nurses' adherence to safety guidelines for more activation of it.

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