



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

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### Abstract

**Background:** Work is considered a basic part of one's life experience. Every type of work brings with its' risks and health hazards. The working environment of new graduate bachelor nurses (NGBN) 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 NGBNs' health and increases their productivity. **Aim:** the study aimed to evaluate effect of safety measures program for prevention of occupational hazards among NGBN. **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. **Sample:** Convenience sample includes all (60) NGBN. **Tools:** Two tools were used in this study. **First tool:** NGBNs knowledge questionnaire; it includes two parts, *first part:* to assess NGBNs' personal characteristics, and *second part:* to assess NGBNs' knowledge toward safety measures for prevention of occupational hazards. **Second tool:** NGBNs' observational checklist to assess NGBNs' practice toward safety measures for prevention of occupational hazards. **Result:** The study findings revealed that there were statistical significance general improvement in NGBNs' knowledge ( $43.766 \pm 3.021$  &  $34.0 \pm 3.188$ ) at immediate post and follow-up program respectively. The majority of NGBN has good level of practices at immediate post and follow-up the program in comparisons to pre-program was poor level. **Conclusion:** The study concluded that there were statistical significant improvement in NGBNs' knowledge and practices after implementation of the program. Also there were statistical significant positive correlation between NGBNs' knowledge and practices. **Recommendation:** Continuous and periodical safety measures programs for prevention of occupational hazards among NGBN in Medical-Surgical Departments and Outpatient Clinics at Benha University Hospital. Further research: Replication of the study on a larger probability sample is highly recommended to achieve generalization of the results.

**Key words:** Safety measures program, Prevention, Occupational Hazards, and New Graduate Bachelor Nurses.



## Introduction

Nursing is a profession that is overwhelmingly concerned with the care of others and it tends to neglect itself. Work related injuries impact the health care organization by increasing costs through medical expenses, loss of working days as well as reduced ability to provide services by the workers. Nursing personnel consider a wide range of workplace hazards exposure than other health care personnel because of the nature of nursing everyday jobs, the theater invasive procedures such as positioning, turning, walking patients. Unprotected workplace may lead to high loss of workers which leads to more employer financial losses in recruiting more workers and loss of skills. These losses are minimized by promoting occupational safety and health (Amukugo, et al., 2015; Adelosoye et al., 2016).

Health care providers' workforce is considered one of the largest work forces in the world; it composes over 12% of the working individuals over the entire world (Goniewicz et al., 2012). Over worldwide million of the workers exposed to the work place accidents and hazardous substances. Almost one million work related deaths and 250 million occupational accidents occur annually. In developing county, there is worsening condition due to some reasons that each year many workers suffered with injuries, lack of education, inadequate medical facilities, lack of correct information, and literacy at work place. Occupational hazards are the 10<sup>th</sup> leading cause of diseases and death at work place. Across the United States, nursing and residential care facilities ranked third among the top 10<sup>th</sup> industries with the highest rates of nonfatal injuries and illnesses in the workplace. Nurses are at high risk for work related injury due to the

physically demanding work and the environment in which it is conducted (World Health Organization WHO, 2009; Perhats et al., 2012; Faremi et al., 2014).

Occupational hazards refer to work environment activities, material, substance, process or condition that have the potential to increase the risk of injury or ill health. Also it's can be arising from one's employment. Occupational health hazards mean the expected risks to health and safety for those who work outside the home. Occupational hazards among NGBN were injuries, work related stress and low back pain from lifting, pushing or pulling and transferring patients to beds, chairs, and toilet (WHO, 2009; Galougahi, 2010; 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; 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. While the psychosocial hazards



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are emotional as anger and depression or behavioural as fatigue, tension, conflicts with peers or supervisors dissatisfaction and unrealistic personnel expectations (**WHO, 2009; Orly, 2012; Stanyar, 2014; Aly, 2015; Bazeyo et al., 2015**). Psychological hazards, is referred to passive self-perception, negative view on life in general, and shifts in mood such as; irritation with anything, loss of self-confidence, feeling of emptiness, loss of self-control, feeling of bitterness, feeling of defeat, crying for no visible reason, willingness to give everything up, long-standing feeling of despair, passive image of self and difficulties to concentrate (**Burdorf & Ijzelenberg, 2014; Eljedi, 2015**). Furthermore, social hazards, is concerned with difficulties in family relationships and feeling of isolation, insensitivity towards others, affective relation difficulties, social life difficulties, barriers in making friends, social isolation, difficulty in decision making about personal life, and uncontrolled aggressiveness (**Branco et al., 2010; Sarafis et al., 2016**).

Occupational hazards are very common in developing countries where workplace hazards are more sever. Moreover, it was confirmed that 95% of nursing professionals are exposed to occupational hazards. Additionally, each year, there are as many as 250 million occupational injuries resulting in 330000 fatalities. Annually, an estimated 160 million new cases of work related disease occur worldwide. Moreover, the sharp injuries have been recognized as one of the occupational hazards among healthcare workers. Medical sharps injuries cause about 2 million HBV, 900, 000 HCV and 170, 000 HIV infections among health care workers each year globally (**Hassan, 2005; WHO, 2006; Dropkin et al., 2013; Hassan, 2014**)

The nursing practice environment is often very complex with demands on high

level of competency and capability to collaborate as a member of the health care team. 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. The transition from student to nurse is significant problem that affects all NGBN (**Duchscher, 2012; Karahan, et al., 2012; Kuokkanen et al., 2016**). Student nurse after passing the board exam become registered nurses and go through many different emotions upon graduation and employment as a nurse. Initially, they have a sense of joy and pride about achieving a goal. Once they begin their job as a nurse, these emotions may turn to feelings of inadequacy, insecurity about skills, and sometimes even fear of making a wrong decision. Additionally, reality shock has been acknowledged as part of the NGBNs' transition, which occurs for all of them during the initial work experience and occurs with the transition from the educational to the service setting where there are different priorities and pressures. It includes phases of honeymoon, shock, recovery, and resolution (**Karahan et al., 2012; Reimche, 2017**).

Factors and barriers that effect on safety protective measures and that interfere with the safe practice of care include: absence of role model, and the high work load or lack and inaccessibility of sinks. Additionally, hazards and risks might results from poor supervision, lack of time and knowledge, forgetfulness, lack of means, negative influence of the equipment on nursing skills, uncomfortable equipment, and lack of training, insufficient experience on the job, conflict between the need to provide care and self-protection and distance to vital/essential supply, equipment or facility (**Hassan, 2005; Aliyu & Auwal, 2015; Aly, 2015; Amadhila et al., 2017**).



Several protective safety measures must be taken to reduce exposure to occupational hazard. Engineering control strategies, which are designed to modify or eliminate 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 (Faremi et al., 2014; Fletcher et al., 2015; Ndejjo, et al., 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. NGBN constitute the largest group of healthcare workers, and experience a higher rate of workplace occupational hazards exposure than other health care workers, 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 work place violence. Occupational hazards in work place affect not only the workers but also the agency itself by its' effect on wage loss, medical payment, workplace disruption, loss of productivity, high absenteeism rate, low employee morale and loss of job (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 more time at work, thus safe and healthy work places are essential. 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 taken to reduce chances of exposure to these occupational hazards in health care environment 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. Design and implement safety measures program for prevention of occupational hazards among NGBN.
4. Evaluate the effect of safety measures program for prevention of occupational hazards among NGBN.

### Research hypotheses

There will be general improvement in the NGBNs' knowledge and practice toward safety measures for prevention of occupational hazards after implementation of the program. 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 Qalubia Governate, Egypt, according to hospital needs additionally; the patients' numbers in these departments are more than other departments.

### Sample

Convenience sample; which includes all NGBN. 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 NGBN).

### Tools of data collection

*Two tools were used to collect the study data:*

#### The First Tool: NGBNs' knowledge Questionnaire

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), 5-psychological 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 →  $\geq 60\%$  that equals  $\geq 30$  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 exposure 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 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  $\geq 75\%$  that equals between  $\geq 84-112$  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:** All tools of the current study were reviewed by 5 experts in the field of community health nursing, nursing administration and medical-surgical nursing from Faculty of Nursing, Benha University to ensure its clarity and applicability.

**Reliability:** The reliability was done by Cronbach's Alpha Coefficient test which revealed moderate to high reliability of each tool. The internal consistency of the first tool was 0.876 and the second tool was 0.857.

### **The pilot study**

A pilot study was carried out on 10% from the total number of study sample (6) NGBN to assess the tools clarity, objectivity and feasibility as well as to estimate the time needed for filling the tools. It was done in the end of October 2017. The pilot study was included in the main study sample.

### **Field work**

- A written official letter was obtained from the Dean of the Faculty of Nursing, Benha University and delivered to the Directors of Benha University Hospital in order to obtain their approval for conducting the study after explaining the purpose of the study.
- The study was talk approximately 11 months; the study was carried out from at the beginning of July 2017 to the end of May 2018.

### **The preparation phase**

- The researchers reviewed current related literature and theoretical knowledge of the

various aspects that concerning topic of the study to develop and construct the study tools of data collection; and planning for safety protective program. 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. In addition to reviewing of recent related literature. Then with this information and the detected needs were translated for developing the safety protective program.
- The safety measures program covers the following items; definition of occupational work hazards and its types, contributing factors of occupational hazards, safety measures for prevention of occupational hazards, and nursing practice during application of protective safety measures.
- Starting in preparing and designing of safety measures program to provide NGBN 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**

- The researchers met NGBN and explained the aim and nature of the study and method of filling the questionnaire. This was done individually or through group meetings. Also the NGBN were grouped according to their department location into 6 groups each group contains 10 NGBN.
- The questionnaire were distributed by the researchers to the participated NGBNs before implementing the program during the



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period of November 2017, to fill it during their work hours (morning and afternoon shifts) which determined before with head nurse of each unit according to type of work and their workload to gain their support and ensure the continuity of patient care. After that the researchers were observe NGBNs' practice regarding safety protective measures for prevention of occupational health hazards.

### ***The Implementation Phase***

- The program was implemented in previous mentioned units at Benha University 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 implemented the safety measures program with one group separately in the day by using available resources, relevant contents and instructional strategies for each session. Different methods of teaching were used such as lectures, small group discussion, brainstorming, role playing, group activity, and practice sessions. Instructional media/teaching aids used were included power point presentation, handout prepared by the researchers and distributed to all NGBNs in the first day.
- 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***

- A pretest was conducted prior to the sessions. Purposes and nature of the study was explained to NGBNs 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 estimating 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**

Each NGBN was informed about the purpose and benefits of the study then oral consent was obtained before starting the data collection. Confidentiality was ensured throughout the study. The NGBNs were assured that all data was used only for research purpose and each NGBN were informed of the rights to refuse or withdraw at any time of the study.

### **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  $P \leq 0.001$ .

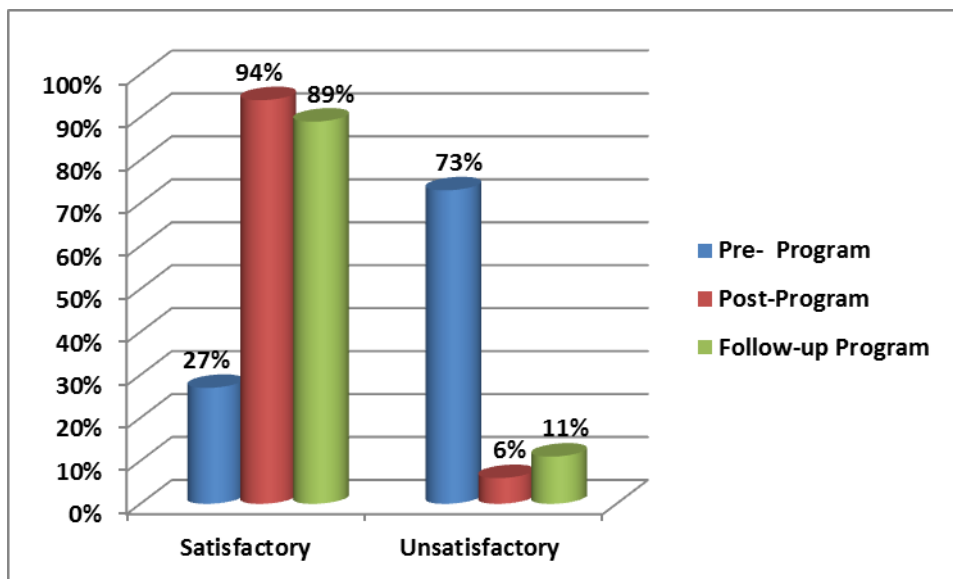
## Results:

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

Personnel characteristics	Total (N=60)	
	N	%
<b>Department / unit</b>		
Medical	30	50%
Surgical	21	35%
Outpatient	9	15%
<b>Age</b>		
≤ 24 Years	29	48.3%
25 Years	23	38.3%
26 Years	8	13.3%
<b>Mean and S.D</b>	24.66±0.704	
<b>Gender</b>		
Male	18	30%
Female	42	70%
<b>Marital status</b>		
Single	41	68.3%
Married	19	31.7%
<b>Years of experience</b>		
1-< 6months	48	80%
6-12 months	12	20%
<b>Grade Score</b>		
Excellent	22	36.7%
Very Good	29	48.3%
Good	9	15%
<b>Education before joint nursing collage</b>		
High Secondary school	39	65%
Associated nursing institute	21	35%
<b>Training in occupational Hazards and safety measures</b>		
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  $\leq 24$  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 training in occupational hazards and safety measures.





**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).**

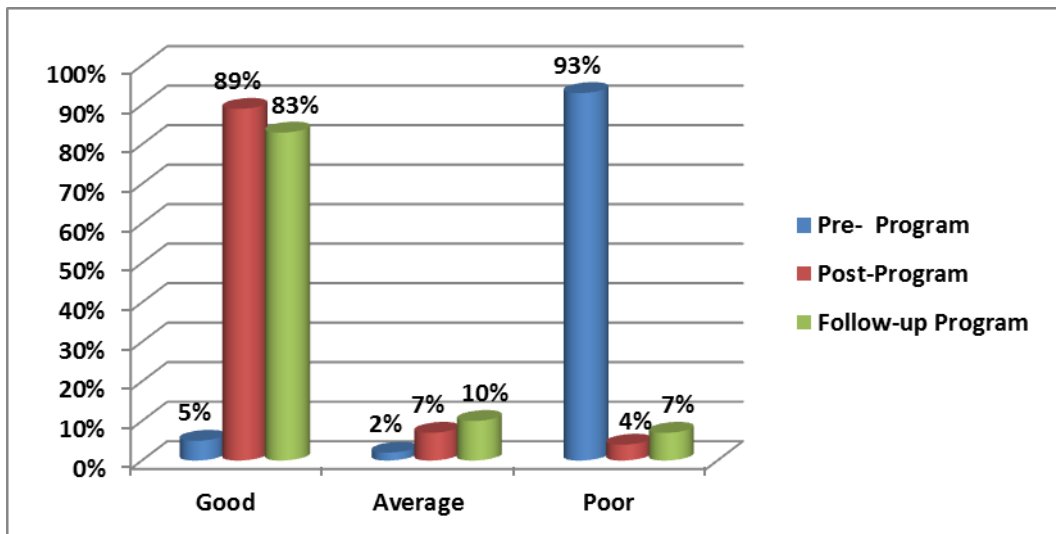
**Figure (1):** This figure shows that, that there was statistical general improvement in total level of NGBNs' knowledge after intervention of the program both immediately post and follow-up after three months of the program. In the pre-program; (73%) of NGBNs' knowledge was unsatisfactory; while in the immediate post and follow-up it was improved and increased to (94% & 89%) and became satisfactory respectively.

**Table (2): Mean 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
<b>Total Knowledge</b>	<b>50</b>	<b>11.50</b>	<b>±3.500</b>	<b>43.766</b>	<b>±3.021</b>	<b>34.0</b>	<b>±3.188</b>	<b>105.63</b>	<b>0.001</b>

(A statistical significant difference  $P \leq 0.05$  and A highly statistical significant difference  $P \leq 0.001$ )

**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 (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.

**Table (3) : Distribution 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 <sup>2</sup>	P value
	Good	Average	Poor	Good	Average	Poor	Good	Average	Poor		
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 protective clothes (mask, gloves, and eye covering)	0%	8.3%	91.7%	66.7%	10%	23.3%	58.3%	18.3%	23.3%	72.846	0.001
Dealing with 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 problems (body mechanics) when lifting	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  $P \leq 0.05$  and A highly statistical significant difference  $P \leq 0.001$ )

**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 NGBNs 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.

**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  $P \leq 0.05$  and A highly statistical significant difference  $P \leq 0.001$ )

**Table (4):** This table reveals that, there was positive statistically significant correlation between NBGNs' knowledge scores and their practice scores. This mean when NBGNs' 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	P-value	X <sup>2</sup>	r	P-value	X <sup>2</sup>	r	P-value	X <sup>2</sup>
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
Training in occupational Hazards & safety measures	-0.250	0.05	7.246	0.00	0.998	6.417	-0.159	0.226	13.871

(A statistical significant difference  $P \leq 0.05$  and A highly statistical significant difference  $P \leq 0.001$ )

**Table (5):** This table indicates that, there were statistically significant positive relation among NBGNs' knowledge scores and their age, training in occupational hazards and safety measures. While there weren't relation among NBGNs' 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 <sup>2</sup>	r	P value	X <sup>2</sup>	r	P value	X <sup>2</sup>
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
Training 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  $P \leq 0.05$  and A highly statistical significant difference  $P \leq 0.001$ )

**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 training in occupational hazards and safety measures.

## Discussion

Work is considered a basic part of one's life experience. Every type of work brings with it risks and health hazards. Occupational hazards associated with health are present in every occupation, and they are the leading cause of death and mortality. The working environment of NGBN and other healthcare providers 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 workplace improves NGBNs' health and increases their productivity (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 agreement 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



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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 two fifths of studied nurses were males and more than one half of them were single.

Concerning years of experience, the study findings revealed that, the majority of them have less than six months of experience. These may be due to the studied subjects were new graduate nurses and practices for one year at Benha University Hospitals. This finding is in the same context of **Labrague et al., (2012)** who studied "Operating room nurses' knowledge and practice of sterile technique", and clarified that length of 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 is supported by **Adejumo and Olatunji, (2013)**, when they reported that above sixty percent of nurses had diploma certificates.

In relation to training in occupational hazards and safety measures, the findings of this study revealed that about two thirds of NGBN haven't any training in occupational hazards and safety measures. This result is 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 attend any training 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 do not receive safety and health training which, leads to unavailability of occupational safety and health policy in place. Also **Almurr (2013)**, who reported that respondents do not take a training regarding safety protective practices. Supporting to these study findings **Spasic, (2010)**, who stated that modern surgery requires a group of suitably skilled personnel who are able to deal with the demands of their complex work environment and deliver safe care for surgical patients. Opposite to the present study

Regarding knowledge of the NGBN about occupational hazards, there is a lack of NGBNs' knowledge before program implementation. This may be due to the need for NGBN in medical-surgical and outpatient areas 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 most of the registered nurses have a lack of knowledge on the ways that they can be exposed to occupational hazards such as handling of sharp instruments, lifting of patients and exposure to airborne diseases. The foregoing results are in agreement with these results of **Ghosh, (2013)**, who stated that there is evidence that nurses are exposed to many occupational hazards and it seems that there is a lack of information on the causes,



prevention and management of occupational injuries/illnesses"

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 examination, policies and procedures for occupational safety and in effective supervision as more contributing factors for occupational hazards.

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 of memorization, ability of knowledge acquisition, the accumulation of learned knowledge of life, and the refreshing information using different approach of active learning during implementation of program, such as work

activities and small group discussion, 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 NGBNs' 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 studied nurses' practices related to safety of intraoperative surgical patient undergoing general anesthesia 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



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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 NGBNs' 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 NGBNs' 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 NGBN' knowledge and practice. Which revealed that when NGBNs' 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 NGBNs' knowledge and age, and training in occupational hazards. This because knowledge and skills is increased and improved with time, training 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, **Sager, (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.

## 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 NGBNs' knowledge and their age and previous training; also there were positive statistically significant relation among NGBNs' practices and their gender and marital status.

## Recommendations

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

- Continuous and periodical educational safety measures programs for prevention of occupational hazards among NGBN in Medical-Surgical Departments & Outpatient Clinics at Benha University Hospital.
- Guidelines, sufficient booklets and posters regarding occupational work hazards and safety measures should be provided and distributed to all the units/departments periodically, so that all nurses will be able to read and follow it.
- Hospital administrators should reinforce the effective communication concerning occupational hazards and safety measures to the subordinates in the wards. This can be done through in-service training, group meetings and workshops.
- Hospital quality unit had to initiate an In-service education and training courses for nursing staff in the different departments of the hospital about occupational hazards and its safety measures.
- Hospital administrators must be motivate their staff by several different methods for keeping safety measures instructions through provision of providing needed supplies, equipment's, and support in work.

## 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 measures guidelines and strategies for more activation of it.
- Further studies must be conducted about factors that affecting on reporting of occupational hazards.





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