



THE EFFECT OF WORK ENVIRONMENT ON REPRODUCTIVE HEALTH OF FEMALE NURSES

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Abstract

Background: The healthcare work environment is surrounded by health hazards that only present in healthcare sector. These hazards reflect on menstruation, causing premature rupture of membranes or abortion that negatively affects the reproductive health of female nurses.

Aim of study: the study aims to assess the effect of work environment on reproductive health of female nurses.

Subjects and methods: A descriptive retrospective design used to achieve the aim of the study. The study conducted in Diarb Negm hospital in Elsharkia governorate.

Convenient sample used in this study. Two data collection tools were used in the study, a structured interview questionnaire and observational checklist.

Results: the study revealed that there was a great negative effect of work environment on female nurses' reproductive health as 66.1% of the studied female nurses suffered from menstruation irregularities during working in the hospital, 59.2% of studied nurses experienced abortion and less than one quartile of them had experienced preterm labor due to different work circumstances.

Conclusion: the study concluded that work environment hazards reflected negatively on female nurses' reproductive health through causing reproductive health problems like miscarriage and premature birth.

Recommendations: Educational sessions for female nurses regarding work hazards and reproductive health.

Keywords: work environment, Reproductive health, Female nurses

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1. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) stated that healthcare work environment is surrounded with many health hazards. These serious hazards include exposure to radiation, sharp injuries, physical workload, infections, irregular work schedule, stress, back injuries, and work place violence which subsequently affect female nurses' reproductive health (NIOSH., 2021).

Regarding reproductive effects, the Occupational Safety and Health Administration (OSHA) reported cases of spontaneous abortion, fetus congenital anomalies of oncology nurses who exposed to hazardous drugs (HDs) such as antineoplastic medications (Perry et al., 2022). Another study made on united states (US) oncology nurses who mix and administer these hazardous medications, found a high proportion of pregnancy complications. Also, some subsequent studies found that chronic exposure to HDs increase the risk of developing cancer mainly in reproductive system (Krettek et al., 2021).

• Significance of the study

The influence of healthcare workplace environment on female nurses' reproductive health was selected to be investigated because, it was stated that female nurses suffer from psychosocial stress, irregular work schedule and physical workload. Therefore, nursing shiftwork has been linked to irregular menstruation, high risk pregnancy, and disrupt women fertility. This effect on reproductive health is the main core of this research. (Krettek et al., 2021).

A recent survey conducted in US found that 40% of abortion cases before 28 week gestation among nurses was due to work overload in critical care areas. Furthermore, the research illustrated that 3% of congenital malformations caused by exposure to radiation and toxicants in healthcare workplace. Unfortunately, there is lack in Egyptian research about this topic. Hence, it is significant to study this problem about the effect of healthcare work environment on reproductive health of female nurses (Mohanty et al., 2019).

- **Aim of the study:**

The aim of this study was to assess the effect of work environment on reproductive health of female nurses.

- **Research question**

What is the effect of work environment on reproductive health of female nurses?

2. SUBJECT AND METHODS

- **Technical design:**

The technical design includes research design, setting, subject and tools for data collection.

- **Research design:**

Retrospective descriptive study utilized in the current study.

- **Setting:**

The study was conducted in Diarb Negm hospital in Elsharkia governorate of Egypt.

- **Sampling**

A convenient sample included 106 female nurses working in the previously mentioned setting

Tools for data collection:

Tool I: A structured interviewing questionnaire

This tool adapted from (Isara and Ofili., 2020). This tool was written in an easy simple Arabic language and modified by the researcher based on the literature review and included three parts.

Part one: personal characteristics of the study sample

included age, sex, educational level, and marital status.

Part two: Obstetric history of study sample

This part composed of fourteen questions aimed to assess presence of obstetric problems such as abortion, or preterm labor.

Part three: Work environment description sheet.

This part was modified by researcher based on the aim of the study. This part aimed at assessing the hospital work environment and work hazards. This part composed of 36 questions. The questions included availability of PPE, hospital sanitation, nurses' exposure to violence and the result of the violence on nurses' reproductive health.

Tool II: This tool developed by the researcher and was written in an easy and simple Arabic language and consist of 7 questions to assess positive and negative behavior of female nurses.

Tools validity:

Tools were given to a panel of three experts, two experts in maternal and newborn health nursing and one expert in community health nursing to test the comprehensiveness, clearness, applicability, simplicity, and relevance of the tools to the aim of the study. After receiving feedback and comments from the experts, the data collection tools were organized and modified by adding and removing some items.

Tools Reliability:

Cronbach's Alpha analysis was used to determine the internal reliability of the tools. It was (0.784) for

obstetrics and menstrual history of the studied female nurses, and (0.758) for description of work environment, and it was (0.939) for the effect of work environment on female nurses' reproductive health.

ETHICAL CONSIDERATIONS:

An official permission to conduct the study was obtained from the scientific research ethics committee of faculty of Nursing Helwan University. Participation in the study was voluntary and full information was given to female nurses about the study aim before taking their approval. The ethical considerations included clarifying the right to withdraw at any time and confidentiality of information.

Operational design

- **Preparatory phase**

This phase included gathering related literature including the past, recent, local and international literature to develop data collection tools.

- **A Pilot study:**

This study was implemented on 10% of the study sample (11 nurses). This pilot study was conducted to test the objectivity of the data collection tools, recognize any unexpected problems, determine the time needed to gather required data, evaluate the feasibility of the study and provide an opportunity for tool adjustment and revision. Based on the results, the pilot study was excluded from the current study.

- **Field work:**

- The study started after obtaining the needed administrative approval from female nurses working in Diarb Negm central hospital to be participated in the study.
- Permission from the hospital nursing matron was taken to attend the working hours with female nurses to observe the surrounding situations and circumstances during working especially in ICUs and ER department.
- The researcher started collecting the data at the beginning of March 2022 and finished at the end of June 2022 in the study setting.
- The researcher collected the data from 9 A.m to 2 P.m two days a week.
- The researcher started by introducing herself to the hospital female nurses and clarified the aim of the study and they have the freedom to withdraw from the study at any time. Besides, illustrating that all the information given will be confidential and only used for the scientific purpose.
- The interviewing questionnaire fulfilled individually with each female nurse.
- The questionnaire included observational tool which was fulfilled by the researcher to record the nurses' positive and negative attitude such as using PPE.

- Data collection needed 20 minutes with each nurse in every interview to gather the needed information.
- Simple and easy understandable language was used to correspond with the level of understanding of nurses and their educational level.

• **Administrative Design:**

An official letter was obtained to conduct the study from the dean of faculty of nursing at Helwan university. This letter is directed to the general manager of Diarb Negm hospital asking for cooperation and permission to conduct the study after explanation the study aim.

STATISTICAL DESIGN:

The collected data was computed and analyzed using Statistical Package for the Social Science (SPSS), version 25 for analysis. Graphics were made through using Excel program. The P value will be set at 0.05. Descriptive statistics tests as numbers, percentage, mean \pm standard deviation (\pm SD), was used to describe the results. Appropriate inferential statistics “t” test was used as well. All statistical tests were evaluated as P-value (≤ 0.05) for significant result and P-value (< 0.01) for high significant result while P-value (> 0.05) for non-significant result.

3. RESULTS

Table (1): Distribution of the studied female nurses regarding demographic characteristics (n=106).

Demographic Characteristics	No.	%
Age:		
20 : 25	18	17%
26 : 35	33	31.1%
36 : 45	49	46.2%
More than 45	6	5.7%
Mean \pm SD	31.51 \pm 3.24	
Age at marriage (n=76)		
18 : 20	15	19.7%
21 : 23	23	30.3%
24 : 26	36	47.4%
More than 26	2	2.6%
Mean \pm SD	23.761 \pm 1.98	
Social status:		
Single	30	28.3%
Married	55	51.9%
Divorced	10	9.4%
Widow	11	10.4%
Educational level:		
Diploma in Nursing	20	18.9%
Nursing Institute	39	36.8%
Bachelor of Nursing	42	39.6%
Master/doctorate Degree in Nursing	5	4.7%
Workplace:		
Inpatient Departments	36	34%
Emergency Department	17	16.1%
Hemodialysis Unit	12	11.3%
Operating Room	10	9.4%
Intensive Care Units	31	29.2%

Table (1) reveals that, less than half 46.2% of studied nurses aged between 36 to 45 years with Mean \pm SD = 31.51 \pm 3.24 and nearly half (47.4%)

of them aged at marriage were from 24 to 26 years with Mean \pm SD = 23.761 \pm 1.98.

Table (2): Distribution of the studied female nurses regarding menstrual history (n=106).

Menstrual history	No.	%
Regularity of the menstrual cycle:		
Regular / Monthly	33	31.1%
Irregular	73	68.9%
Menstrual duration:		
< 3 days	22	20.8%
$\geq 3 \leq 7$ days	33	31.1%
> 8 days	51	48.1%

Pain during menstrual cycle:		
Mild	33	31.1%
Moderate	55	51.9%
Severe	18	17%

Table (2) more than half (68.9%) of female nurses had irregular menstruation and less than half (48.1%) of nurses revealed that menstruation lasts > 8 days.

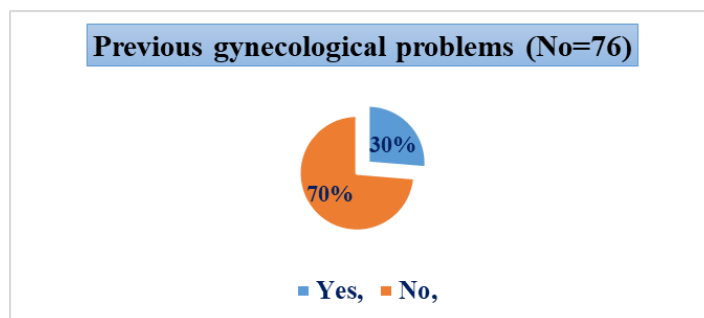


Figure (1): Distribution of the studied female nurses regarding previous gynecological problems (No=76)

Figure (1) illustrated that 30% of the studied nurses had previous gynecological problems such as vaginal bleeding and polycystic ovarian syndrome accompanied with pelvic pain.

Table (3): Description of work environment (N=106)

Items	No.	%
Availability of supplies and PPE		
Yes	28	26.4%
No	78	73.6%
Nurses' exposure to violence		
Yes	91	85.8%
No	15	14.2%
Distribution of pregnant nurses at low work load areas (No=76)		
Yes	27	35.5%
No	49	64.5%
Distribution of pregnant nurses at critical areas (No=76)		
Yes	48	63.2%
No	28	36.8%
Pregnant nurses work in night shift (No=76)		
Yes	49	64.5%
No	27	35.5%
Nurses' exposure to stress due to work conflicts at hospital (No=106)		
Yes	90	84.9%
No	16	15.1%

Table (3) revealed that, more than two thirds (85.8%) of the studied female nurses exposed to violence from patients or their relatives. More than half of nurses (63.2%) were distributed in critical care departments during pregnancy.

Table (4): Effect of work environment on female nurses' reproductive health (No=106).

Variables	No.	%
Abortion (No=76)		
Yes	45	42.5%
No	61	57.5%
Causes of abortion (No=45)		
Carrying a heavy weight during working	10	22.2%
Working in night shift	5	11.1%
Long and hard working hours	9	20%
Long exposure to formalin or anesthetic gases in operations room	2	4.4%

Working in ICUs or isolation wards for Covid-19	6	13.3%
Violence exposure	13	29%
Causes of premature birth (No=24)		
Standing for long hours during working in the hospital	3	12.5%
Working nights shifts for long periods	4	16.7%
Long exposure to formalin or anesthetic gases in operations	2	8.3%
Violence exposure	15	62.5%
Menstrual cycle disorders (No=106)		
Yes	70	66.1%
No	36	33.9%
Causes of menstrual cycle disorders (No=70)		
Hard work during shifts	5	7%
Psychological stress due to the hospital work environment	4	5.7%
Working nights shifts for long periods	60	85.7%
Working with Covid-19 patients led to infection	1	1.4%

Table (4): showed that (42.5%) of the studied nurses reported exposing to abortion with different causes like; carrying a heavy weight (22.2%), long and hard working hours (20%) and violence

exposure (29%). Also, (59.2%) of the studied female nurses reported experiencing premature birth and 62.5% of them reported that violence exposure was a main cause.

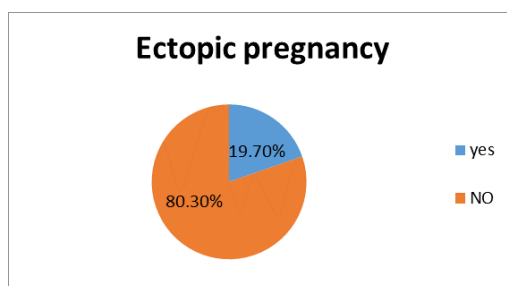


Figure 2: Ectopic pregnancy in the studied female nurses (No= 76)

Figure 2: reveals that 19.7% of the studied female nurses suffer from ectopic pregnancy and they reported that chronic pelvic infection from the long

time use of unclean hospital toilets is the main cause.

Table (5): Distribution of the studied nurses according to their negative and positive attitude (n=106).

Items	(No.= 106)		Chi square test	
	N	%	X ²	p-value
Using available PPE by nurses				
Done	100	94.3%	21.475	<0.002*
Not Done	6	5.6%		
Maintaining the cleaning of toilets by nurses				
Done	88	83.1%	19.258	<0.002*
Not Done	18	16.9%		
Pregnant nurses enter the radiology unit despite of the warning signs (No=76)				
Done	6	7.9%	17.357	<0.002*
Not Done	70	92.1%		
Nurses walk in slippery floors despite of the warning signs				
Done	10	9.4%	12.159	<0.002*
Not Done	96	90.6%		
Nurses request to work in nightshift during pregnancy				
Done	9	11.8%	15.249	<0.002*
Not Done	67	88.2%		
Nurses' commitment of wearing PPE during working in COVID-19 isolation units				
Done	103	97.2%	13.346	<0.002*
Not Done	3	2.8%		

Chi square test for Friedman test * statistically significant at $p \leq 0.05$

Table (5): revealed that more than half 94.3% of the studied nurses reported that they committed in wearing PPE. Also, 90.6% of nurses did not walk

in slippery floors to avoid the risk for falls which might cause abortion.

Table (6): Relationship between occupational health hazards and different types of personal protective equipment

Variables	Physical hazards				Biological hazards				Psychological hazards				Mechanical hazards			
	Not Exposed		Exposed		Not Exposed		Exposed		Not Exposed		Exposed		Not Exposed		Exposed	
	(n=31)		(n=75)		(n=44)		(n=62)		(n=33)		(n=73)		(n=36)		(n=70)	
Overall uniform:																
Not available	1	3%	10	13%	2	5%	6	9%	2	6%	9	12%	4	11%	2	3%
Not used	5	16%	35	45%	4	9%	8	13%	6	18%	12	16%	6	17%	5	7%
Used	25	81%	32	42%	38	86%	50	78%	25	76%	54	72%	26	72%	65	90%
X ²	0.837				4.116				1.413				2.222			
P. value	0.733				0.109				0.627				0.370			
Head cover:																
Not available	0	0%	2	3%	2	5%	5	8%	2	6%	1	1%	0	0%	1	1%
Not used	1	3%	5	6%	2	5%	8	13%	3	9%	4	5%	5	14%	11	15%
Used	30	97%	70	91%	40	91%	51	80%	28	85%	70	93%	31	86%	60	83%
X ²	3.637				5.677				8.493				7.898			
P. value	0.146				0.313				0.108				0.417			
Eye goggles:																
Not available	13	42%	50	65%	16	36%	52	81%	10	30%	21	28%	7	19%	19	26%
Not used	3	10%	12	16%	7	16%	0	0%	5	15%	26	35%	16	44%	12	17%
Used	15	48%	15	19%	21	48%	12	19%	18	55%	28	37%	13	36%	41	57%
X ²	6.152				5.444				9.710				7.488			
P. value	0.079				0.058				0.307				0.093			
Gloves:																
Not available	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Not used	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Used	31	100%	77	100%	44	100%	64	100%	33	100%	75	100%	36	100%	72	100%
X ²	2.532				5.776				2.499				3.059			
P. value	0.327				0.116				0.238				0.200			
Protective apron																
Not available	25	81%	32	42%	38	86%	50	78%	25	76%	54	72%	26	72%	65	90%
Not used	5	16%	35	45%	4	9%	8	13%	6	18%	12	16%	6	17%	5	7%
Used	1	3%	10	13%	2	5%	6	9%	2	6%	9	12%	4	11%	2	3%
X ²	0.850				5.981				6.120				5.734			
P. value	0.690				0.052				0.241				0.086			
Respiratory mask:																
Not available	0	0%	4	5%	2	5%	1	2%	2	6%	4	5%	5	14%	2	3%
Not used	5	16%	8	10%	8	18%	6	9%	7	21%	7	9%	6	17%	16	22%
Used	26	84%	65	84%	34	77%	57	89%	24	73%	64	85%	25	69%	54	75%
X ²	1.508				0.901				0.526				0.628			
P. value	0.436				0.698				0.896				1.000			

Statistically significant at p ≤ 0.05

Table (6): shows that, there was no statistically significant difference between personal protective

equipment and various types of occupational health hazards among the studied female nurses.

4. DISCUSSION

Concerning the demographic characteristics of the studied nurses, it was shown that nearly half of the studied nurses were between the ages of 36:45 years old and married and the lowest percentages were divorced, more than one-third had a bachelor degree of nursing.

These results were similar to Elizabeth (2022) who studied "Risks and Safety of Women Healthcare Workers in Aizawl District, Mizoram, India" and found that age of more than half of the studied sample between 31:40 years, more than half had more than 10 years of experience and more than half of studied female nurses were married, also more than one third of female nurses graduated from nursing institute.

These results contradicted with Selvi (2020) who studied "Occupational Health Hazards among Women Workers in Healthcare Industry: An Analysis" and reported that nearly half of the age group to the studied nurses were within (20-24) year. The same author disagreed with the current study, reporting that nearly three quarter of studied female nurses had a diploma in nursing.

Regarding menstrual history, more than half of studied female nurses had irregular menstrual cycle and less than half of nurses had more than 8 days as menstrual duration.

These results were in the same line of Elizabeth (2022) who stated that menstrual irregularities are common in female nurses who exposed to patients violence, insomnia, anxiety, loss of appetite, depression and low self-esteem in healthcare environment.

Regarding the effect of work environment on reproductive health of female nurses, more than two thirds of the studied female nurses reported exposing to violence mainly in ER department. The results of the current study corresponded with the results of Giusti and Ramacciati (2020) who study "Workplace violence in emergency departments: The health professionals and security personnel alliance" in Australia. This study stated that violence incidents from patients, visitors and relatives against healthcare workers especially female nurses were common in emergency department.

In addition, the current study showed that more than half of studied female nurses distributed in critical care units and also work in night shift during pregnancy unite the sixth month of pregnancy.

The current study results were in the same line with Cai et al., (2020) who study "The impact of occupational activities during pregnancy on pregnancy outcomes: a systematic review and meta-analysis" in United States of America. The study reported more than three thirds abortion cases among female nurses work in ICUs, also two thirds of low birth weight infants, and the results of this study found that the majority of studied pregnant nurses experience preterm labor due to excessive physical effort and heavy lifting of more than 100kg objects either obese patients or heavy weight supplies during daily nursing care such as performing bed bath or bed making to overweight patients in intensive care units.

Regarding abortion, premature birth, and menstrual disturbance causes study results reported the following causes: carrying heavy objects during working, long and hard working hours (48 hour weekly), long exposure to formalin or anesthetic gases in operation rooms, infection with Covid-19 during working in isolation department, working in night shift for long time, psychological stress and violence exposure.

The study results of Hammouda et al., (2018) who study "Occupational Genotoxic effects among a group of nurses exposed to anesthetic gases in operating rooms at Zagazig university hospitals" in Zagazig, Egypt stated that formalin exposure through inhalation of aerosolized droplets, vapors and skin exposure cause serious reproductive effects and pregnancy outcomes like abortion. Also, all waste anesthetic gases (nitrous oxide, halothane, and ether) are embryo toxic and have teratogenic effects. Regrettably, operating room female nurses exposed to these waste anesthetic gases and formalin also are more susceptible for abortion by long exposure.

Also, the result of the current study corresponded with Liao et al., (2020) who study "A Hierarchical Model of Occupational Burnout in Nurses Associated With Job-Induced Stress, Self-Concept, and Work Environment" In China who confirmed that pregnant women work more than 25 hours a week have a big risk of abortion and premature fetus with low birth weight.

According to the statement of the studied female nurses the hospital obligate nurses to work from 36 to 48 hours a week due to staff shortage which deeply affect female nurses' reproductive health. Also the study highlighted that standing for long hours during working cause serious pregnancy complications such as increase the risk for abortion, disturbance in maternal blood pressure (hypotension or hypertension) especially if physical effort is required. The same study of Liao et al., (2020) confirmed that standing for more than 2.5 hours per day increase 10% the risk for preterm labor and abortion.

These results also corresponded with Zalut and Abdallah (2022) who studied "Occupational reproductive health hazards among university working females" in Zagazig and stated that working in health care systems expose female nurses to many health hazards that cause negative reproductive outcomes especially menstrual irregularities such as dysmenorrhea and long menstrual period. This irregularity caused by increased muscular effort particularly in female nurses work in Intensive care units and exposure to chemical substances and radiation.

5. CONCLUSION

According to the results of this study, it could be concluded that, work overload, stress, violence exposure and night shift were the main causes of reproductive health issues because of the nature of nursing work.

RECOMMENDATIONS:

Based on the results of the study, the following recommendations were proposed:

- Ask policy maker to secure a good balanced meal for pregnant nurses especially who work 12 hours shift.
- Exclude pregnant nurses from working in night shift from the second trimester.
- The nursing role should be restricted on the professional roles only.

FURTHER STUDIES:

- Further studies about the effect of work environment on reproductive health of female nurses in Egypt with studying its preventive measures.
- Further studies about the importance of the role of hospital cleaners should be made

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