

Occupational Hazards and Self-Reported Health Problems among Photocopy and Printing Workers at Assiut University, Egypt

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Abstracts: Background: Photocopy and printing workers have a great chance of exposure to polluting materials and various hazardous substances that are harmful to human health. Objective: This study aims to assess occupational hazards and self-reported health problems among photocopy and printing workers. Design: Descriptive cross-sectional study was conducted among 163 workers at central printing press, including printing and photocopies offices of faculties, Assiut University. Methods: A structured questionnaire was administered through face-to-face interviews by the researcher. All respondents were interviewed during the period from first of February to the first of July 2022. It comprised four main parts Part One: Demographic and occupational data. Part Two: Self-Reported health problems of study participants. Part Three: Workplace environment at photocopy and printing offices. Part four: Studied workers' knowledge about occupational hazards and their knowledge about health risks associated with each hazard. Results: The study revealed that 89.0% of studied workers were male, 39.9% of them were aged from 40-50 years. Alongside, 89.6% of studied workers had poor knowledge about occupational hazards and health risks of each hazards. The most frequent muscle-skeletal problem among studied workers was back pain 36.2%. Approximately 9.8% complained from vomiting. Regarding respiratory problems, shortness of breathing was reported by 25.8% of the participants. About 10.4% of studied workers suffered from visual impairment. Also, 22.7% of participants complained from skin irritation. Conclusion: The study concluded that poor knowledge about occupational hazards, so they at higher risk for different work-related health problems.

Keywords: Occupational Hazards, Self-Reported, Health Problems, Photocopy, Printing, Workers.

1. INTRODUCTION

The publishing and printing industries have expanded greatly both in Egypt and globally. There are a large number of workers worked in these sectors. As a result, their work environment is important in determining their health; it can have a harm impact on their health. Therefore, the presence of hazards in the work environment such as dust, toxic chemicals, dangerous machines, and noise that causes work-related diseases, injuries, and sometimes death. The prevalence of occupational illnesses and accidents is rising **(1, 2)**.

The International Labor Organization (ILO) estimates that there are more than 120 million workplace accidents worldwide each year, resulting in 2.2 million fatalities and an excessive amount of medical expenses and lost productivity. Even though developing nations account for 75% of the world's labor force, only 5% to 10% of workers there have access to occupational health services **(3)**. Millions of workers exposed to ink, dye, gases in the workplace and for long period but, little are known about their knowledge these effects on health.**(4)**

Photocopy and printing workers have a higher risk of exposure to physical, chemical, mechanical, psychological and ergonomic hazards. Chemical hazards such as (inks, volatile, toxic compounds) are harmful to health. Inhaling of these toxic or corrosive substances, direct contact with the skin, or accidentally ingesting contaminated food or drinks are resulting in skin and eye irritation, dizziness and vomiting.**(5)**

Occupational exposure to pulmonary irritants can result in lung parenchyma, pleura and breathing problems. The long-term effects of exposure include fibrosis, lung damage, and cancer. Low doses of exposure to a variety of irritants can impair lung function. Acute workplace chemical exposure was the cause of 5% of asthma cases and 2-3% of alveolitis cases. Persons who have had asthma in the past, even small amounts of chemical emissions exposure can activate disease recurrence and attack **(6, 7)**. Furthermore, noise from printing devices is considered as top occupational risk factors in many countries resulting in Noise-Induced Hearing Loss **(8)**.

The Ultra-violet (UV) and infrared radiation produced by photocopying machines damages collagen fibers accelerates skin ageing and deplete the vitamin C in the skin which may cause further damage. Cataracts can develop in the eyes as a consequence of exposure to UV radiation in high doses. The operator should therefore wear the proper personal protective equipment to minimize exposure to hazardous radiation in order to minimize the health risks. **(5)** Protection measure has to be taken while operating printing/photocopying machine such as frequent dilution of room air via adequate ventilation, allow fresh air exchange in workplace as well as artificial air conditioner **(9)**.

Reducing the effects on health during printing can be accomplished through many techniques and strategies such as sufficient ventilation and air conditioning, which helps to promote heat dilution in the workplace. Also, the operator should keep a 1 meter distance while working to avoid excessive heat and temperature exposure from the machine, which can reduce the risks of photocopying. Operators should be educated on suitable working positions to avoid ergonomic issues. Furthermore, the work environment should be designed to minimize tiredness and the risk of work-related musculoskeletal discomfort. **(9, 10)**.

The occupational health nurse plays a significant role in recognizing workplace threats, determining workers' health issues, early case finding, management, and referral to the relevant community health facilities. The occupational health nurse also assesses each job task to discover workplace conditions that put workers at risk. This is done through work environment evaluation and surveillance to find prospective hazards that may arise as the work progresses, as risks reduction. **(11)**

1.1. Significance of the Study

Photocopy and printing devices releasing several harmful substances when operating, and they are representing an important issue of public interest since millions of working population worldwide would be affected.

Based on a study conducted at Turkish printing and publishing sector, it was concluded that, printing and publishing sector is classified as dangerous work due to its production processes. The frequency of occupational accidents in Turkish printing and publishing sector is two times higher than European countries. **(12)**

Moreover, according to a study conducted at Ain Shams University in Egypt, the occupational hazardous reported by the printing workers were contact with chemicals affecting the respiratory system (50.9%), backache (68.4) , followed by exposure to chemicals affecting the skin (33.3%), and chemicals affecting eye (26.9%). **(13)**

Photocopy and printing machine operators are routinely exposed to the associated risks and mostly being unaware of them. Consequently, those population at higher risk of ill health and would create health problem within the community **(10)**. Photocopy and printing workers may be exposed to high levels of a variety of contaminants released by photocopiers **(14)**. In addressing this research problem this study aimed to determine the occupational hazards and self-reported health problems among photocopy and printing workers.

1.2. Research question

1-What is the percentage of occupational hazards and self-reported health problems among photocopy and printing workers at Assiut University?

1.3. Research method

1.3.1. Design: A descriptive cross-sectional research design was used in this study.

1.3.2. Setting:

The study was conducted at the central printing press, all printing and photocopies offices at Assiut University faculties.

1.3.4. Sample

Study participants were 163 workers (male and female) included in the present study.

Sample size was calculated using statistical program of EPI-info version 7.2 using population survey or descriptive observational study calculation, according to the following parameters; The proportion of the good knowledge 13% (15), acceptable margin of error was 5%, confidence level 90%, design effect 1. The minimum required sample size was 123 subjects. To compensate for non-response rate, sample size was raised to 163 as total coverage of photocopy and printing workers at Assiut University.

1.4. Instruments of study

Data was collected by interviewing the studied workers using a structured questionnaire that was designed after reviewing the comprehensive relevant literature. It comprised four main parts:

-Part One: Demographic and occupational data such as; age, gender, marital status, educational level, years of work experience, working hours/day, performed job tasks (The nature of the work).

- Part Two: Self-reported health problems among study participants such as muscle-skeletal, gastrointestinal, respiratory, central nervous system, skin, and sensory (vision and hearing) complaints. The occurrence of these complaints was considered for the last 6 months.

- Part Three: This tool was developed after reviewing of literature, to assess the workplace environment in photocopy and printing offices (27 places) included questions (12) with probable answers of "yes" or "no" about these statements such as sufficient ventilation and lightening. **(9, 16)**

-Part four: This tool was developed after reviewing of literature **(10, 13, 17, 18)**. It comprised 11 questions that measured the studied workers' knowledge about occupational hazards (mechanical, chemical, physical, psychological) and their knowledge about health risks associated with each hazards. The scoring system followed each correct answer given (1) and incorrect given (0). The total scoring was calculated from 66 grades and classified as poor if the score was < 50%, fair if the score was 50% to 70% and good if the score was > 70%. **(19, 20)**.

1.5. Validity

Panel of three experts in community health nursing at Assiut University assess the study tools for clarity, applicability and comprehensiveness. Modifications made based on their recommendations **(19, 21)**.

1.6. Reliability

A reliability analysis was carried out in order to examine the internal consistency of its questions. The value of Cronbach's alpha was 0.859 for knowledge. **(19, 21)**

1.7. Assessment of the questionnaire

Testing the study questionnaire was conducted on (10%) 17 workers, to assess the clarity and simplicity of study tools, no modifications were made and the pilot included to the studied sample.

2. DATA COLLECTION

The structured questionnaire was administered through face-to-face interviews by the researcher. All respondents were interviewed during the period from first of February to the first of July 2022 (about 5 months consumed). The study participants interviewed at two days weekly, four workers/ day through five months. A clarification of the purpose of the research was presented to all workers to get their consent before beginning data

collection. The average time took to complete interviewing each worker ranged from 20-30 minutes. Then the researcher assessed the workplace environment for each setting separately.

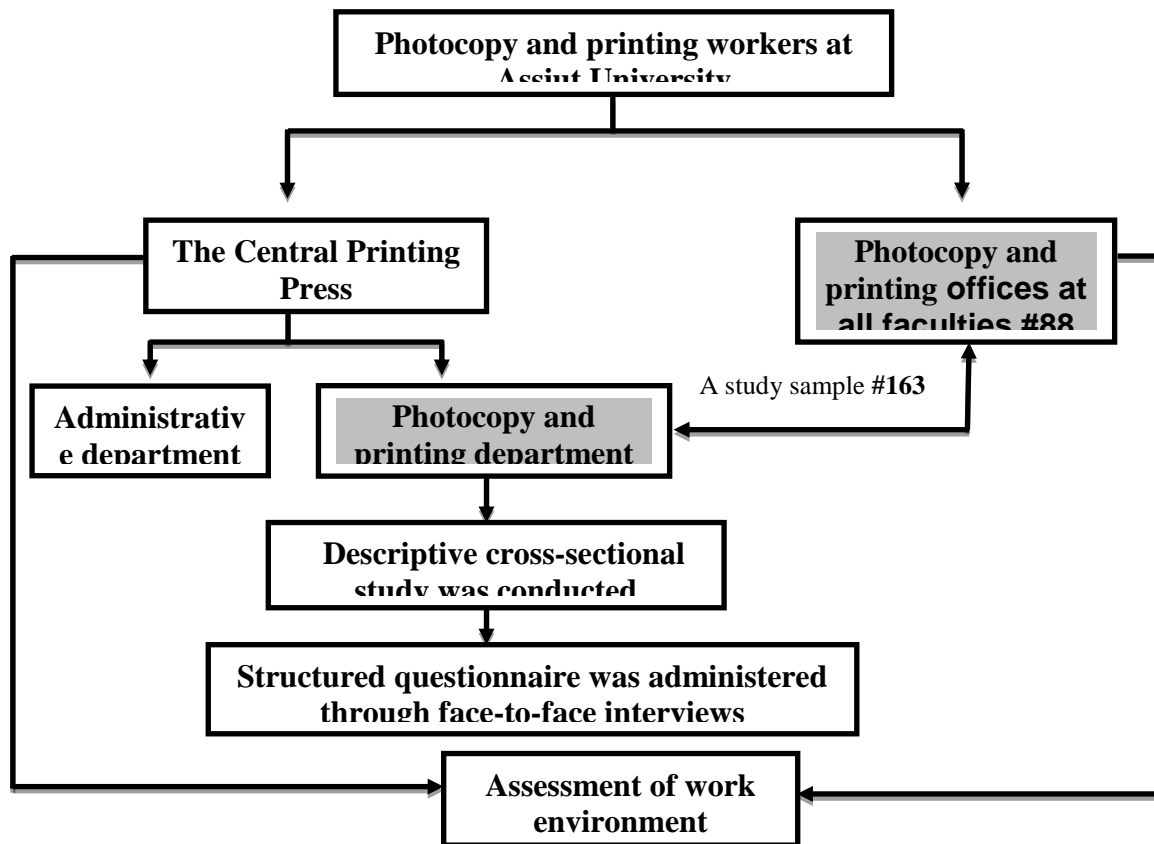


Figure1. Flow chart of the research

2.1. Ethical considerations:

Written approval was obtained from Ethical Research Committee in The Faculty of Nursing, Assiut University (Approval no: 1120230295). Consent was secured orally from the participants in the study. The researcher has explained the aim of the study to all workers in the study sample. They reassured that any obtained information would be strictly confidential.

3. RESULTS

Table 1: The studied workers comprised 39.9% were aged from 40-50 years, and 89.0% of them were male, 68.1% of them had secondary/institute education. Also, 89.0% of them were working on photocopy and printing for more than five years. In accordance to performed job tasks data cleared that 42.9% of them worked at printing & photocopying sector.

Figure 1: It was found that 89.6% of studied workers had poor knowledge, 7.3% fair knowledge and 3.1% good.

Table 2: It was showed that 77.8% of photocopy and printing offices had bad ventilation, only 25.9% of places supplied with hand washing materials as soap and water, also, 14.8% of places maintained storage of chemicals package properly.

Table 3: The most frequent musculoskeletal problems were back pain (36.2%). Approximately, 9.8% complained from vomiting. Regarding to respiratory problems, shortness of breathing was reported by 25.8% of

them. About 10.4% of the studied workers suffered from visual impairment. Furthermore, this table showed that 22.7% of them complained from skin irritation.

Table 4: There was statistical significance difference between back pain, skin irritation and age. On the other hand, no statistical significance difference between back pain, shortness of breath and skin irritation with gender, educational level and years of experience.

Figure 2: According to the study, 37.5% of studied workers at binding and packing sector complain from back pain, shortness of breath reported by 24.0% among workers at printing and photocopy sector, and 25.0% of studied workers at binding and packing sector. Additionally, skin irritation reported by 33.9% of studied workers at binding and packing sector.

Table (1): Demographic and occupational characteristics of the studied workers, Assiut University, 2022

Characteristics	No. (163)	%
Age: (years)		
< 40	62	38.0
40 - 50	65	39.9
> 50	36	22.1
Mean \pm SD (Range)	43.06 \pm 8.59	(27.0-59.0)
Gender:		
Male	145	89.0
Female	18	11.0
Marital Status:		
Single	15	9.2
Married	140	85.9
Divorced	5	3.1
Widow	3	1.8
Educational level:		
Basic education	24	14.7
Secondary/ institute	111	68.1
University / postgraduate	28	17.2
Years of experience:		
Less than 5 years	18	11.0
More than 5 years	145	89.0
Working hours/ day:		
Less than 8 hours	66	40.5
More than 8 hours	97	59.5
Performed job tasks:		
Printing and photocopying	70	42.9
Lifting and transferring printing papers	20	12.3
Binding and packaging	56	34.4
Stock	17	10.4

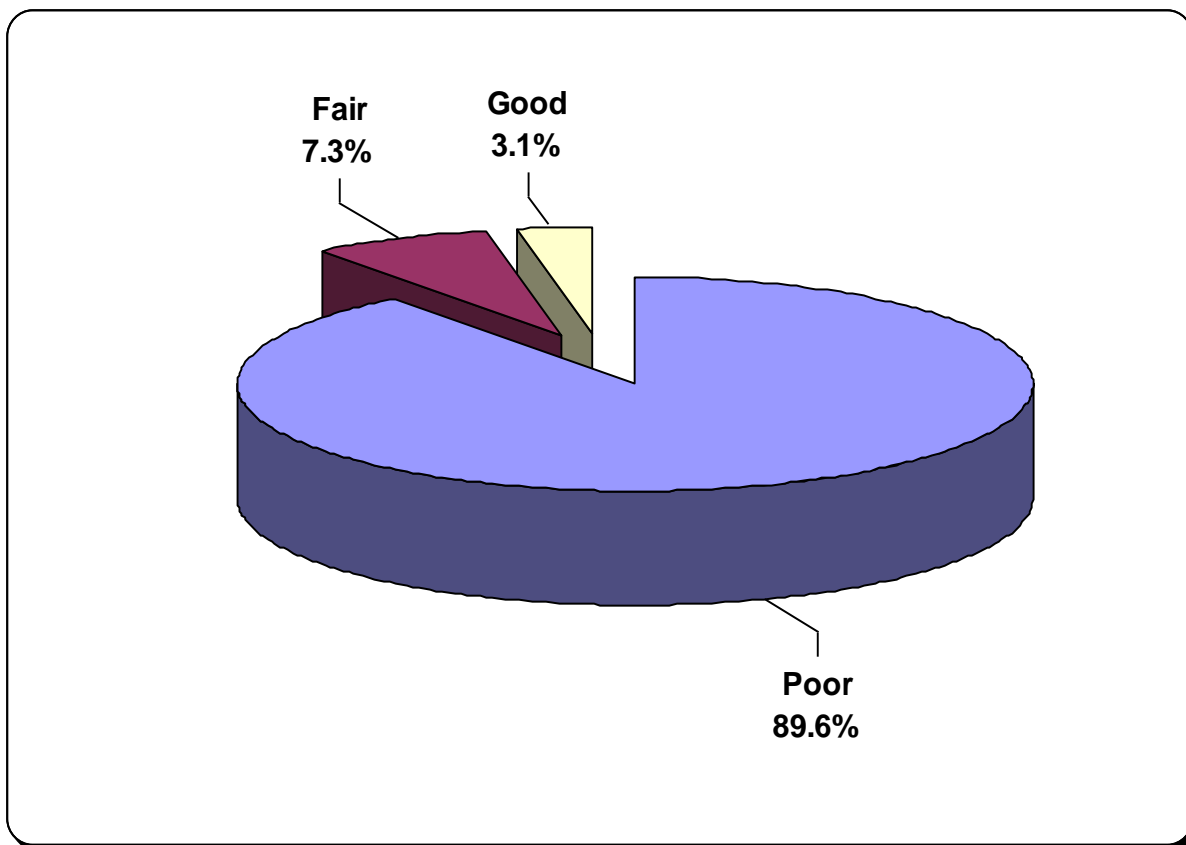


Figure (1): The studied workers' Knowledge about occupational hazards and health risks associated with each hazards at Assiut University, 2022.

Table (2): Assessment of workplace environment at printing-press, photocopies and printing offices at Assiut University, 2022

Workplace environment (#27)	Yes		No	
	No.	%	No.	%
Presence of good ventilation in printing and photocopies area	6	22.2	21	77.8
Presence of natural ventilation system (opening windows and doors)	14	51.9	13	48.1
Presence of an artificial ventilation system (fans and centrifuges)	21	77.8	6	22.2
Presence of floors clean and dry	12	44.4	15	55.6
Presence of enough lights in the workplace	12	44.4	15	55.6
Presence of bathrooms kept clean and dry	10	37.0	17	63.0
Presence of sufficient number of toilets in relation for number of workers	8	29.6	19	70.4
Presence of hand washing tools such as water and soap	7	25.9	20	74.1
Presence of fire extinguishers in the workplace	22	81.5	5	18.5
The fire extinguishers checked frequently	22	81.5	5	18.5
Presence of sufficient exits to allow immediate escape in the emergency	6	22.2	21	77.8
Presence of clear signs of escape in the time of emergencies	4	14.8	23	85.2
Chemical package stored properly	4	14.8	23	85.2

Table (3): Self-reported health problems reported by studied workers, Assiut University, 2022.

Variables	No. (163)	%
Musculoskeletal problems*		
Back pain	59	36.2
Fatigue (general fatigue)	44	27.0
Neck pain	33	20.2
Joint pain	30	18.4
Finger tingling (numbness)	7	4.3
Fractures	7	4.3
Varicose veins	6	3.7
Others (Muscle contraction, Feet swelling)	8	5.0
Gastrointestinal problems*		
Abdominal cramps	12	7.4
Vomiting	16	9.8
Diarrhea	11	6.7
Food poisoning	4	2.5
Stomach pain and ulcers stomach	2	1.2
Respiratory system complains*		
Shortness of breath	42	25.8
Chronic cough	15	9.2
Respiratory irritation (sneezing)	10	6.1
Sore throat	7	4.3
Rhinitis	10	6.1
Chest pain	12	7.4
Problems of the central nervous system*		
Dizziness	13	8.0
Fainting	10	6.1
Lack of concentration	2	1.2
Visual problems/ complain*		
Visual impairment	17	10.4
Eye infections	1	0.6
Blurring vision	4	2.5
Hearing problems*		
Hearing impairment	8	4.9
Tinnitus	5	3.1
Partial hearing loss	4	2.5
Types of skin problems*		
Skin irritation	37	22.7
Skin redness or inflammation	25	15.3
Skin sensitivity	15	9.2

*More than one response is permitted.

Table (4): Association of the studied workers' demographic, occupational characteristics and most frequent self-reported health problems (back pain, shortness of breath and skin irritation), Assiut University, 2022

Variables	Back pain				P-value	Shortness of breath				P-value	Skin irritation				P-value
	Yes		No			Yes		No			Yes		No		
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
Age: (years)															
< 40	15	24.2	47	75.8	0.003*	16	25.8	46	74.2	0.431	9	14.5	53	85.5	0.048*
40 – 50	23	35.4	42	64.6		14	21.5	51	78.5		15	23.1	50	76.9	
> 50	21	58.3	15	41.7		12	33.3	24	66.7		13	36.1	23	63.9	
Gender:															
Male	51	35.2	94	64.8	0.440	39	26.9	106	73.1	0.568	35	24.1	110	75.9	0.369
Female	8	44.4	10	55.6		3	16.7	15	83.3		2	11.1	16	88.9	
Educational level:															
-Basic education	13	54.2	11	45.8	0.133	8	33.3	16	66.7	0.855	9	37.5	15	62.5	0.136
-Secondary/ Institute	36	32.4	75	67.6		27	24.3	84	75.7		21	18.9	90	81.1	
-University/ Postgraduate	10	35.7	18	64.3		7	25.0	21	75.0		7	25.0	21	75.0	

Years of experience in:														
Less than 5 years	6	33.3	12	66.7	0.789	6	33.3	12	66.7	0.408	2	11.1	16	88.9
More than 5 years	53	36.6	92	63.4		36	24.8	109	75.2		35	24.1	110	75.9

*Chi-square test

*Fisher Exact test

* Statistically significant difference (p<0.05)

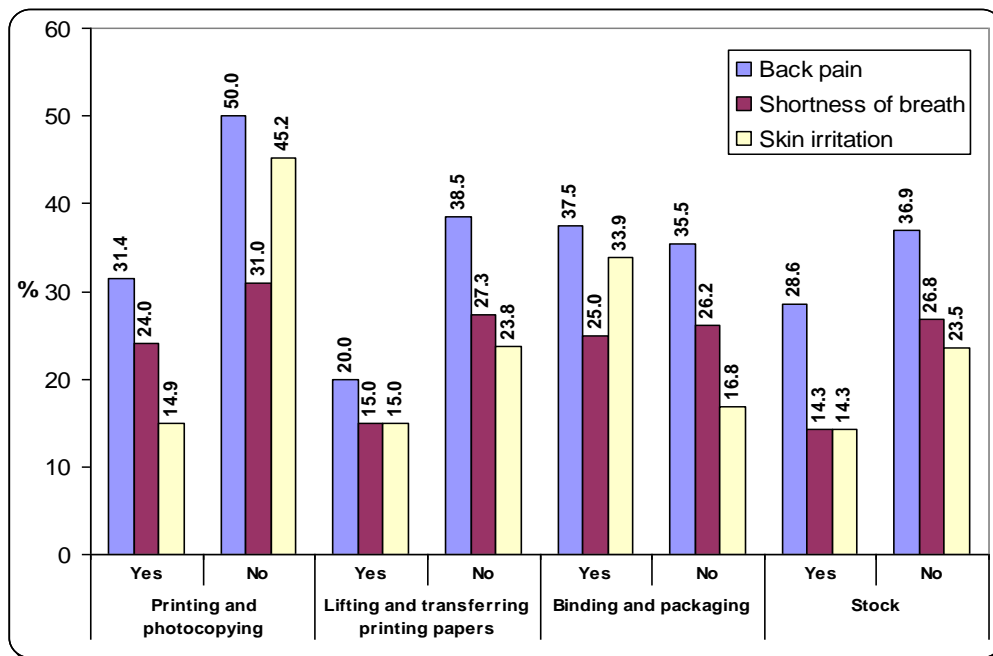


Figure 2: Association of performed job tasks and self-reported back pain, shortness of breath and skin irritation among photocopy and printing workers, Assiut University, 2022.

4. DISCUSSION

Every year, about 2 million people are reported to suffer from illnesses caused or aggravated by their work. Printing and photocopy workers being generally exposed to many hazardous materials which might lead to various health issues.(17, 22)

In referral to demographic characteristics of the studied workers in the present study, the mean age of studied workers was (mean± SD) 43.06 ± 8.59 (27.0-59.0), this result came to an agreement with Ibrahim et al., (13); Who informed that the mean age was (mean± SD) 42.65 ± 9.33.

The finding of the present study were incompatible with Lyu et al., (23) who included participants with more than 16 years.

The results of the existing study revealed that the majority of the studied workers were males, this is predominant due to working in photocopies and printing offices, requires physical power and effort to move, collect, load and store papers after printing that females can't tolerate. Similar findings reported by Decharat (24) who revealed that more than three fifths were male. Also, Foong et al., (25) referred that three fifths of workers were male.

With regard to marital Status, it was found that the majority of the studied workers were married. This study was in agreement with Foong et al., (25) who noticed that more than three fifths of them were married. This finding agreed with Ibrahim et al., (13) who revealed that the majority of workers were married.

According to educational level, it was noticed that more than three-fifths of studied workers had secondary/institution education and only less than fifth had university education which might be explained that photocopy and printing processes are not highly technical. Moreover, printing work depend heavily on experience and job proficiency rather than education. These results of the present study concurred with Ibrahim et al., (13) who reported that more than half had secondary or technical education. Also, Yilmaz et al., (12) were reported that two fifths of studied workers had secondary education.

With regard to years of experience, the present study illustrated that the majority of studied workers had more than five years of work and nearly two-thirds of them work for more than eight hours per day. This result agreed with Butt et al., (10) who clarified that 37 worker had 4-6 years of experience and 67 worker stay at work from 11-12 hours daily.

The present study agreed with Foong et al., (25) who revealed that mean years of experience was $M \pm SD 9.97 \pm 7.59$. Furthermore, Agbenorku et al., (26) reported that three quarters of employee had 5-10 years of experience. These finding in accordance with Decharat, (24) who concluded that more than three fifths of them worked for more than 8 hours per day.

These results were not in consistent with Yilmaz et al., (12) who stated that about two fifths of the studied workers had 0 – 3 years of experience.

In accordance to performed job tasks, the existing study disclosed that more than two fifths of studied workers worked in printing and photocopying, these data in line with Nasrin et al., (17) who cleared that more than three fifths of studied sample worked in printing department. Also, Agbenorku et al., (27) reported that two fifths of participants worked at printing sector.

The current data revealed that, the majority of printing and photocopy workers had poor knowledge. Also, Rose et al., (15) declared that only thirteen percent of studied workers had good level of knowledge. As well, Basheer et al., (8) reported that the study participants had poor knowledge towards Noise-Induced Hearing Loss. Likewise, Ibrahim et al., (13) concluded that the study population' awareness about hazardous occupational exposure was low.

Concerning to workplace environment at central printing-press, photocopies and printing offices, the current result confirmed that more than three quarters of the studied workplace had poor ventilation. Finding of the current study in line with Ibrahim et al., (16), who noticed that printing and booking department had poor ventilation.

This result is different from that reported by Rose et al., (15) ,who noticed that the majority of printing workshops were ventilated although narrow, it was also noted that the vast majority of screen printers worked without an air evacuation system. Furthermore, Decharat (24) had obtained that about one-third of screen printing workshops ventilated (door and windows open) and more than three-fifths for the presence of ventilation systems in the workshops.

Concerning to self-reported musculoskeletal complaints, it was found that nearly two fifths of them suffered from back pain; this may be related to manual handling, carrying heavy loads and standing for long period. These finding in line with Foong et al., (25) who had disclosed that lower back were the higher prevalence problem (nearly half of respondents). Too, Starovoytova (28) noticed that printing workers are operating at awkward-postures for long time, making them at higher risk for work-related musculoskeletal disorders as (back pain).

In referral to respiratory system, more than one quarter of studied workers were reported shortness of breath, this can be explained as a result of ink inhalation, and other chemicals in the work place with lack using of personal protective equipment as face mask. These finding agreed with Nasrin (29) who found that less than one third of respondents complained from coughing. Also, Abdulateef & Talib (30) stated that workers had a high prevalence of respiratory problems specially allergies. In contrast, Decharat (24) reported that the prevalence of shortness of

breathing in nearly fifth. Moreover, Karimi et al., (31) reported that thirty from 150 exposed workers had shortness of breath, press on chest.

With regard to exposure to vision problems, only ten percent of studied workers suffered from visual impairment, these may ally to exposure to ultraviolet rays while photocopying. These data in accordance with Nasrin (29), who noticed that eye irritation reported by one third of studied workers. Also, Decharat (24), disclosed that the vast majority of workers experienced eye irritation during the preceding six months. Moreover Rose et al., (15) noted that the majority of participants reported organs/systems most likely to be affected were the eyes.

The present study revealed that hearing impairment also, reported among studied workers, as a result of exposure to noisy machines. These finding aligned with Yilmaz et al., (12) and Butt, (10) who found that hearing disturbances reported complaints among studied participants.

Regarding to exposure to skin problems, the current study displayed that more than one-fifth of studied workers suffered from skin irritation. It may be related to exposure to chemical materials such as gases and ink especially without personal protective equipment which may increase the liability to skin irritation. The same consequence founded by Decharat (24),who was reported that the majority of studied workers had allergic skin reaction. Moreover, Nasrin (29), who reported nearly two fifths of studied workers, had itching of the skin. Also, Karimi et al., (31) declared that 19% of employee had experienced skin problems.

Finally, With regard to association between skin irritations with gender, it was found that no statistical significance difference between skin irritation and age in the current study. In contrast, Lise et al., (32) found that more than three fifths of workers who had skin problems were male.

According to the current study findings, near to two fifth of studied workers at binding and packing sector complain from back pain, also, Chanthong et al., (33) who was found that little more than two fifths were experiencing low back pain.

The current study's strength is that it addressed the total number of photocopy and printing workers at Assiut University (male and female), while other previous studies mainly focused on male workers. The study's findings focused on identifying self-reported health issues among the study participants and their knowledge of occupational risks and their implications on health. The study included a brief assessment of work environment that reflect the value of optimal ventilation and adopts potential solutions to minimize occupational hazards as well as work-related health problems. The study participants had lack of knowledge that reflects the need for dedicate attention for continuous awareness program among photocopy and printing workers.

Implications for practice

Photocopy and printing workers exposed to various occupational hazards affecting their health, the current study focused on determine workers knowledge about occupational hazards and self-reported health problems, to set as a base data for suggesting educational programs for photocopies/printing workers on occupational health hazards and safety measures should be developed, methods of controlling occupational related health problems and promoting health should be implemented. Also, emphasizing on the necessity of good ventilation in the printing and photocopy offices to reduce occupational health hazards.

CONCLUSIONS

This study concluded that printing workers had poor knowledge about occupational hazards, so they at higher risk for different health problems. The main health problems reported by them were musculoskeletal, respiratory, sensory and skin health problems.

Conflict of Interest:

The authors state that they have no known challenging financial interests or personal relationships that could have appeared to influence the work reported in this work.

Acknowledgments:

Sincerely express a gratitude to the employees of the central printing press and all other photocopy and printing offices, Assiut University who participated in this research and made it possible with their cooperation.

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DOI: <https://doi.org/10.15379/ijmst.v10i3.1699>

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