

Occupational Exposures and Health Profile among Workers in an Egyptian Printing Press

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Abstract

Background: Printing workers are at risk of several occupational exposures due to their job nature and their awareness of these hazards is important so that they can protect themselves. **Objective:** The current study aimed at comparing the health status of the printing workers with that of administrative department employees and to describe the knowledge of printing press workers about different exposures. **Method:** 171 printing workers and 175 administrative staff were recruited from an Egyptian press company in Cairo. An interview questionnaire was used including data on socioeconomic, occupational characteristics of the study population; questions about their awareness of different exposures; assessment of the worker's health through asking about various symptoms of different systems were also included. **Results:** The percentage of workers perceiving their working environment as dangerous was significantly higher than that of the administrative group. Most of the workers reported exposure to chemicals affecting the respiratory system (50.9%) followed by exposure to chemicals affecting the skin (33.3%). On the other hand, administrative workers reported spending long time working in one position (47.4%). The percentage of workers was significantly higher than that of administrative staff reporting eye irritation, hearing impairment, tinnitus, tremors, backache, numbness, dyspnea, chronic cough and skin inflammatory symptoms. Percent of administrative staff reporting neck pain was of higher than printing workers but without statistical significance. **Conclusion & Recommendation:** Printing press workers are exposed to various occupational hazards in their work environment which adversely affect their health status. Workers in printing industry need to be targeted by awareness programs to help them understand the types of occupational exposures they may experience and how to protect themselves from such exposures.

Keywords: *Printing Press, Egypt, Printing Workers, Health Status, Occupational Exposures*

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Introduction:

Workers in printing shops are exposed to various occupational health hazards. Each printing process is divided into 3 major steps: prepress, press, and post-press. Prepress operations include the composition, typesetting, graphic arts photography, assembly of images and preparation of image carrier. Press includes the actual printing operation. Post-press

involves the assembly of printed materials, binding and finishing operations.¹

The pollutants generated in the printing industry can be classified into solid (damaged plates, used film and paper waste, empty containers), liquid (waste paint, cleaning solvents, film developing chemicals, acids, alkalis, and metals such as silver, iron, copper, and chromium) and

gaseous wastes (volatile organic compounds (VOCs) emitted mainly by using the cleaning agents, inks, alcohol and other solutions for the dampening of printing plates, nitrogen dioxide, ammonia, carbon monoxide, carbon dioxide, non-methane hydrocarbons.² Workers in this industry have been exposed to these factors through both inhalation and dermal contact.³

The International Agency for Research on Cancer (IARC) classified occupational exposure in the printing industry as possibly carcinogenic to humans and the reported studies did show excesses of lung cancer and bladder cancer and the exposures of interest were considered to include many potential carcinogens.⁴

Noise is considered to be another health hazard at print shops. Noise levels in printing shops may exceed 100 dBA.⁵ Printing presses were found to have a high ratio of accidents per number of hours used. Two of the most frequent causes of accidents are manual handling and contact with machinery.⁶

Knowledge of workers about possible occupational hazards was assessed in some studies; where in one of them when they were asked if dyes affect body organ (s), all the workers agreed that dye (s) had an effect on the skin, but they were unaware that dyes could affect the body elsewhere. All the workers believed that safe methods of handling dyes were important, however; it was also found that only 34% of these workers used personal protective equipment (PPE) as gloves while working.⁷ In another study carried out by Yu *et al.*, 2005 about the knowledge, attitude and practice of printing workers towards organic solvents in Hong Kong, it was found that these parameters were generally low where good knowledge was positively related to being aware of legislations while appropriate attitude was associated with good knowledge and

younger age. Safe practice was neither related to knowledge nor attitude but was associated positively with being informed about safety precautions and information from supervisors. Most workers wanted to obtain information from publications and talks rather than from television.⁸

The printing occupations have been linked to elevated levels of mortality and morbidity from various diseases, including an increased mortality from lung, bladder, hepatic and kidney cancer. Health conditions as reported by participants in one study were commonly allergic dermatitis, asthma and hypertension.⁹

Promoting protective practices such as using personal protective equipment (PPE) and operating machinery safely could dramatically reduce the incidence of health problems and accidents among printing press workers⁽¹⁰⁾. According to the Health Belief Model, it is useful to change behavior by making people perceive susceptibility, threat and benefit and how adopting a good behavior outweighs the risks⁽¹¹⁾. Data describing the health status and hazardous exposures among printing press workers is insufficient in Egypt. To our best knowledge; only one Egyptian study was available in the literature which was carried out in Alexandria by Shama, 2009⁶ among printing press workers from 10 small printing shops without the presence of a non exposed comparable group, The current study describes the health profile among printing press workers which would help in future planning of reducing their harmful exposures through an interventional health educational program and ensuring the availability of personal protective devices that would eventually help to reduce morbidities and mortalities.

Objective: To compare the health status of the printing workers with that of administrative department employees, to

describe the knowledge of printing press workers about different exposures.

Method

Study type: A comparative cross-sectional study was conducted during the period from September 2017 to August 2018 to achieve study objectives

Study setting: This study was conducted in a printing press in one of the most reputable Egyptian newspapers that publishes huge amounts of copies every day. The newspaper building is located in Cairo's city Centre. This printing press is not only famous for publishing newspaper but also for school & university books. The printing press employs about 200 workers who are dedicated for printing newspapers, books and binding of school/university books and 250 employees working in administrative department.

Study population and sampling: All printing workers and administrative department employees who agreed to participate were interviewed. Printing workers (200 workers) in the studied printing press who are exposed to printing hazards distributed in three departments; prepress (computer work & CTP), press (printing department) and post press (finishing department) and administrative department employees (250 employees) who worked in office were eligible to be included. The available workers at the time of data collection were: 171 printing workers and 175 administrative staff and all were included.

Study tools: Structured interview questionnaire was used to collect data from participating printing workers and employees. The questionnaire consisted of the three main sections: Section I: Socio-demographic data of the participants: Age, gender, occupation, years of experience, number of working hours per day, education, marital status and smoking

history were recorded for each participant; Section II: Awareness about different exposures that can affect worker's health; Both the printing workers and the administrative department employees were asked if their job may expose them to hazardous factors; Section III: Assessment of the worker's health through asking the workers if they had experienced any symptoms that would reflect different systems affection for e.g. special senses, central nervous system, motor system, respiratory system, cardiovascular system, dermatological symptoms, digestive system, urinary system & tumors. The questionnaire was adopted from *Civil Engineering construction association, 2010. Health Management Toolkit. Employee health questionnaire* ⁽¹²⁾. The tool was revised & validated by 3 experts in field of occupational medicine and public health. The first two sections were added to the tool; "Sociodemographic criteria and awareness about different exposures"; in addition to that the main tool was revised and adapted to the current research prerequisites "Health profile among printing press workers" and not to reflect the employee health in general; in addition to that symptoms in the main tool were summarized in the context of the current situation to maximize the response rate as it was too long about 11 pages "inquiring about symptoms only".

Data Management and Analysis:

The collected data was revised, coded, tabulated and introduced to personal computer then analyzed using SPSS program (Statistical Package for Social Sciences) for windows Version 23. Qualitative data were presented as frequencies and percentages, while quantitative variables were presented as mean, standard deviation (SD). Independent sample t-test was used to assess the statistical significance of the

Table (1): Socio-demographic characteristics of the studied groups:

| Variables | Printing workers n=171 | | Administrative department staff n=175 | | Chi square test | P-value | |
|-------------------------------------|-------------------------------|-------|--|------|-----------------|----------|--|
| | No | % | No | % | | | |
| | Age (years) | | | | | | |
| 20-29 | 17 | 9.9% | 21 | 12.0 | 2.040 | 0.564 | |
| 30-39 | 47 | 27.5 | 37 | 21.1 | | | |
| 40-49 | 61 | 35.7 | 68 | 38.9 | | | |
| 50-60 | 46 | 26.9 | 49 | 28.0 | | | |
| Age (mean SD) | 42.65 ± 9.33 | | 42.50 ± 9.77 | | 0.148 # | 0.882 | |
| Gender | | | | | 75.264 | <0.001** | |
| Male | 171 | 100.0 | 112 | 64.0 | | | |
| Female | 0 | 0.0 | 63 | 36.0 | | | |
| Marital status | | | | | 9.532 | 0.023* | |
| Single | 14 | 8.2 | 28 | 16.0 | | | |
| Married | 152 | 88.9 | 134 | 76.6 | | | |
| | Divorced/ widow | 5 | 3 | 13 | 7.4 | | |
| Education Level | | | | | 220.65 | <0.001** | |
| Illiterate | 5 | 2.9 | 0 | 0.0 | | | |
| Read and write and Primary | 23 | 13.4 | 0 | 0.0 | | | |
| Preparatory | 24 | 14.0 | 0 | 0.0 | | | |
| | Secondary or technical | 91 | 53.2 | 8 | 4.6 | | |
| | University | 28 | 16.4 | 167 | 95.4 | | |
| Smoking | | | | | 49.994 | <0.001** | |
| Non-smoker | 83 | 48.5 | 147 | 84.0 | | | |
| Current smoker | 70 | 40.9 | 19 | 10.9 | | | |
| | Ex-smoker | 18 | 10.5 | 9 | 5.1% | | |
| Work experience (years) | 20.44 ± 8.71 | | 18.59 ± 9.91 | | 1.842 (#) | 0.066 | |
| Working hours per day | 8.42 ± 1.49 | | 6.37 ± 0.72 | | 16.374 (#) | <0.001** | |
| Perception of safety at work | | | | | 63.161 | <0.001** | |
| Very safe | 4 (2.3%) | | 40 (22.9%) | | | | |
| Unsafe to some extent | 101 (59.1%) | | 120 (68.6%) | | | | |
| Dangerous | 66 (38.6%) | | 15 (8.6%) | | | | |

(#) Independent samples t test; (*) Statistically significant at P<0.05; (**) Highly statistically significant at P<0.01

difference of a parametric variable between two independent means of two study groups. Chi square test was used to examine the relationship between two qualitative variables. P ≤ 0.05 was considered statistically significant and p <0.01 was considered as highly statistically significant.

Ethical Consideration:

Ethical committee board of Faculty of Medicine approval and administrative approval for study conduction were

obtained from the printing press Board of Directors Chairman. Verbal Informed consent was taken from each participant. The confidentiality of data was assured.

Results

The response rate among the printing workers was 85.5% (171 workers out of 200 workers) and among the administrative department employees was 70% (175 employees out of 250 employees).

Table (2): Types of occupational hazards as reported by the printing workers:

| Job nature | Printing workers N=171 | |
|--|---------------------------|------|
| | No | % |
| Pre-press | 35 | 20.5 |
| Press | 91 | 53.2 |
| Post - press | 45 | 26.3 |
| Types of occupational hazards encountered by printing press workers | | |
| Physical hazards | | |
| Noise | 42 | 24.6 |
| Chemical hazards | | |
| Chemicals affecting respiratory system | 87 | 50.9 |
| Chemicals affecting Skin | 57 | 33.3 |
| Chemicals affecting Eye | 46 | 26.9 |
| Mechanical hazards | | |
| Manual handling | 12 | 7.1 |
| Working in a static posture for several hours | 28 | 16.4 |
| Accidents | 19 | 11.1 |
| Psychosocial hazards | | |
| No response from supervisors to their complaints | 8 | 4.7 |

Concerning characteristics of the studied participants; there was a statistically significant difference between both groups as regards gender, marital status; and education level; where all (100%) of the printing press workers were males in comparison to (64%) in the administrative department. The majority (88.9%) of the printing workers were married in comparison to (76.6%) in the administrative department. Regarding the education level; more than half (53.2%) of the printing workers had secondary or technical education while the majority (95.4%) in the administrative department went to university. Moreover, there was a statistically significant difference between both groups regarding smoking status; where (40.9%) of the printing workers were current smokers compared to (10.9%) of the administrative department employees. The mean work experience of printing workers was more than that of the

administrative staff; however; it didn't reach the statistical significance level ($P>0.05$). The mean working hours per day of printing press workers was significantly more than that of the administrative department employees. Moreover, the percentage of workers perceiving their working environment as dangerous was significantly higher among printing press workers than that of the administrative group (38.6% vs 8.6% respectively) ($P<0.05$) (Table 1)

Regarding the hazardous occupational exposures reported by the printing workers, exposure to chemicals affecting the respiratory system was the most common occupational hazard reported by more than half of the printing workers (50.9%), followed by exposure to chemicals affecting the skin (33.3%), chemicals affecting eye (26.9%), noise (24.6%) (Table 2).

Table (3): Types of occupational hazards as reported by the administrative department employees:

| What are the types of occupational exposures you encounter? | Administrative department staff N=175 | |
|---|--|------|
| | No | % |
| Physical hazards | | |
| Bad Illumination | 3 | 1.7 |
| Bad ventilation | 9 | 5.1 |
| Chemical hazards | | |
| Dust | 6 | 3.5 |
| Psychological hazards | | |
| Work overload | 29 | 15.6 |
| Mechanical hazards | | |
| Long time spent in one position | 83 | 47.4 |

Long time spent working in one position was the most common reported occupational exposure by administrative department staff. (Table 3)

Concerning symptoms reflecting the health profile among workers in the studied printing press; a significantly higher percentage of printing press workers reported eye irritation, hearing impairment, tinnitus, tremors, backache, numbness, dyspnea, chronic cough and skin inflammatory symptoms than administrative department employees. On contrast; a higher percentage of administrative staff reported neck pain than printing workers but without statistical significance (Table 4)

Discussion

The printing industry includes complex operations organized into distinct departments. Some operations involve large machinery, moving parts, volatile chemicals, and heavy containers (Leiter et al., 2009)¹³ All printing press workers in this study were males and this may be attributed to the job nature in this occupation which necessitates several tasks that can be suitable for males more than females in Egypt. This is in consistency with the study carried out by Shama, 2009⁶ in 10 small printing shops in Alexandria &

found that most of workers (97.0%) were males. This finding is in contrast to two other studies; Agbenorku et al., 2012¹⁴ in Ghana and Decharat, 2014¹⁵ in Thailand; where the higher participation in the workforce in printing shops was represented by females (37.0% & 34.7%) respectively. There was a statistically significant difference between both groups as regards education level; where administrative department employees had higher educational levels than printing press workers; This is in agreement with Decharat, 2014¹⁵ in Thailand & Yu et al., 2005⁸ in Hong Kong; where more than one third (38.7% & 30.6%) of printing press workers respectively had diploma education. Education is an important factor that affects knowledge as was stated in the study carried out by Osewa et al., 2013¹⁶ who reported significant relationship between educational status and knowledge of occupational hazards and safety practice among Cocoa farmers. On the other hand; there was statistically insignificant difference between both groups regarding age; where more than one third (35.7% vs 38.9%) of the printing press workers & administrative staff were aged between (40-49) years. Mean age was (42.65 ±9.33) among printing press workers. No one is found to be less than 18 years old. This age distribution is higher than what was reported by Shama, 2009⁶; Yu et al., 2005⁸ & Starovoytova, 2017¹⁷; where the mean age was (33.5±11.6, 35.3±10.2 & 34.5±12.5) respectively; this may be because the studied press did not appoint any new workers for the last few years as the press became saturated with enough experienced workers. Moreover, the studied printing press is affiliated to the governmental sector which strictly implements laws against child labor.

Regarding the types of occupational hazards reported by the workers, chemical exposures took the upper hand. This was

Table (4): Comparison between printing workers & administrative department employees regarding reported health conditions:

| | Printing worker N=171 | | Administrative department staff N=175 | | X ² test | P value | Odds Ratio (OR) | 95% CI |
|--|--------------------------|------|--|------|---------------------|--------------------|-----------------------|---------------|
| | No. | % | No. | % | | | | |
| Special senses | | | | | | | | |
| Eye irritation | 75 | 43.9 | 58 | 33.1 | 4.198 | 0.040* | 1.576 | 1.019-2.438 |
| Hearing impairment | 64 | 37.4 | 21 | 12.0 | 30.174 | <0.001** | 4.386 | 2.528-7.612 |
| Tinnitus | 66 | 38.6 | 26 | 14.9 | 24.970 | <0.001** | 3.602 | 2.146 - 6.047 |
| Central nervous system affection symptoms | | | | | | | | |
| Tremors | 36 | 21.1 | 22 | 12.6 | 4.459 | 0.035* | 1.855 | 1.040 - 3.308 |
| Musculoskeletal affection symptoms | | | | | | | | |
| Backache | 117 | 68.4 | 91 | 52.0 | 9.727 | 0.002** | 2.00 | 1.291-3.099 |
| Neck pain | 78 | 45.6 | 91 | 52.0 | 1.412 | 0.235 | 0.774 | 0.507 – 1.181 |
| Joint pain | 82 | 48.0 | 74 | 42.3 | 1.122 | 0.289 | 1.258 | 0.823-1.922 |
| Numbness | 53 | 31.0 | 37 | 21.1 | 4.361 | 0.037* | 1.675 | 1.030-2.725 |
| Respiratory system affection symptoms | | | | | | | | |
| Dysnea | 62 | 36.3 | 13 | 7.4 | 42.338 | <0.001** | 7.088 | 3.718-13.514 |
| Chronic cough | 22 | 12.9 | 11 | 6.3 | 4.340 | 0.037* | 2.201 | 1.033- 4.693 |
| Skin affection symptoms | | | | | | | | |
| Itchy &/or inflamed | 55 | 32.2 | 16 | 9.1 | 28.10 | <0.001** | 4.712 | 2.570 - 8.637 |

(*) Statistically significant at $P < 0.05$; (**) Highly statistically significant at $P < 0.01$

similar to the results of *Reinhold & Tint, 2008*¹⁸ who performed his study in a printing press in Estonia; where a large percentage of the respondents confessed their exposure to chemicals that affects their health. This may be explained by the finding that most of the included workers in the current study (53.2%) were from the press department. This may also explain the high percentage of workers reporting irritating symptoms. Some international studies reported other health effects encountered by printing press workers *Yu et al., 2004*⁸ who clarified that nervous system and mucous membrane irritation

symptoms were found among the studied printing press workers, also *Livesley et al., 2002*¹⁹ found that allergic skin reactions were common while *Vermeulen et al., 2002*²⁰ reported high prevalence of bronchitis like symptoms among printing press workers. *WHO, 1996*⁴ declared that The International Agency for Research on cancer (IARC) classified occupational exposures in printing processes as possibly carcinogenic to humans; Workers in printing industry may be exposed to potentially hazardous levels of solvents, inks, adhesives, organic and inorganic pigments, polycyclic aromatic

hydrocarbons, acrylates, lead, paper dust, and noise. Employees have close contact with chemicals used in cleaning or to the ink solvent evaporating during the printing process.

Regarding the types of occupational exposures reported by the administrative department employees; long time in one static position was the frequently reported occupational exposure. According to *Buckle & Devereux (2002)*²¹, it is believed that working postures, such as sustained or constrained posture, can contribute to development of musculoskeletal disorders. This explains the high frequency of musculoskeletal symptoms reported by administrative department employees in the current study. Workers in many different industries and occupations who are exposed to risk factors at work, such as lifting heavy items, bending, reaching overhead, pushing and pulling heavy loads, working in awkward body postures and performing the same or similar tasks repetitively are at risk for developing musculoskeletal disorders (OSHA, 2018).²²

Skin affection was also reported by printing press workers, This finding was supported by another study carried out by *Livesley et al., 2002*¹⁹ who studied health effects related to printing industry in the UK and reported skin affection symptoms such as itching (61%), rash (58%), and dry skin (56%). The current study also found that symptoms of eye irritation, hearing affection, central nervous system symptoms in the form of tremors were significantly higher in printing press workers than administrative department employees. The chemicals used in the printing industry are the main reason of high frequency of allergies, allergic respiratory symptoms, skin diseases and other important health effects among the studied printing press workers. Good knowledge of workers and their proper

medical follow up is thus mandated to protect adverse health effects.

Conclusion

From the findings of the present study, we can conclude that: The printing environment is hazardous where the workers were exposed to various hazardous mainly chemicals, high degree of noise, and significant mechanical hazards; Awareness of some hazardous occupational exposures (e.g. Noise, mechanical hazards and psychosocial hazards) is low compared to other occupational hazards (chemical exposure). Among the exposed group; there were significantly more prevalent self-reported symptoms regarding respiratory, skin, hearing, vision, musculoskeletal disorders than the non-exposed group.

Recommendation

Pre-employment and periodic medical examination of printing press workers to early detect and treat any diseases is of great importance. Provision of personal protective equipments in work place, educating and training the workers about the hazards they are exposed to and how to protect themselves is needed.

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