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Assessment of health status of workers in plastic industry, Egypt

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Abstract

Background: Workers in plastic industry are exposed to many occupational hazards as chemicals including plastic monomers and additives during industrialization, physical hazards as heat, ergonomic hazards as manual handling and heavy lifting.

Aim of work: To assess health status among workers in Plastic industry in Egypt.

Materials and Methods: The study was a cross-sectional study, during the period between October 2021 to December 2023 in New Delta Plastic Company. A total of 119 employees were participated in the study. To get the necessary information, the researcher had participants fill out an interview questionnaire. Clinical examination was done including general and local examination,

Results: Most of personal protective equipment's were available at work place. There were high prevalence of hypertension (30.8%), ophthalmic problems (28.3%) and skin problems (26.1%) among studied workers.

Conclusion: Working conditions in plastic industry pose several high risks for workers' health.

Recommendations: Regular supervision on personal protective equipment usage. A plastic component is included in the vast majority of contemporary items. There is a significant need for individuals with expertise in the plastics business due to the surge in demand for products including compounding, distribution, and manufacturing.

Keywords: Plastic industry, health status, personal protective equipment

Introduction

Nowadays, plastic is an integral part of almost every contemporary product. Employment opportunities in the plastics industry are plentiful due to the material's high demand in the manufacturing, distribution, and compounding sectors ^[1].

Long chains of repeating monomers make up polymers, which are the building blocks of plastics. There are a number of processes involved in their production, and employees are exposed to potentially harmful substances at different points in the process ^[2].

Modernization and expansion characterize Egypt's plastics manufacturing. According to projections, Egypt's demand for plastics and resins will increase at a rate of 10% per year over the next five years, from an initial 2004 consumption of around 1.2 million tons valued at \$1.65 billion. Raw materials, household appliances, packaging, pipes, fiberglass goods, bottles, car parts, and more are all part of the production scope ^[3].

Workers are exposed to many occupational hazards as chemicals including plastic monomers and additives during industrialization, physical hazards as noise and heat, ergonomic hazards as manual handling and heavy lifting. Knife injuries and entanglement from unexpected movement during machines maintenance, cleaning and repairs ^[4, 5].

Materials and Methods

Study design, time, and setting

A cross-sectional study. It was carried-out at New Delta Plastic Company in Tanta city, Gharbia Governorate, Egypt. It started from 1st October 2021 up to 1st December 2023.

This study included 119 exposed workers in New Delta Plastic Company who were available during the period of the study.

Data collection and tools of the study

All workers were subjected to

1. Direct personal interview questionnaire with study participants during their break time and included the following items

Socio demographic characteristics: e.g., age, sex, education, marital status, habits... etc.

Present occupational history: Duration of occupational exposure, department of work.

Past occupational history including previous jobs and their duration.

History of occupational or non-occupational diseases or accidents.

Health related symptoms regarding different occupational exposures through: A standardised questionnaire patterned according to International Commission on Occupational Health (ICOH) questionnaire

Statistical design

- Following data entry in Excel, the information was imported into SPSS (Statistical Package for the Social Sciences) version 21 for further processing, including sorting, tabulation, and analysis.
- Quantitative data was subject to calculations for range, mean, and standard deviation.
- Regarding qualitative data, which is a collection of numerical values that are described using percentages and frequencies.

- The data were found to be parametric, and we verified their normality using the one-sample Kolmogorov-Smirnov test.

Result

Table 1: Distribution of studied workers according to socio demographic characteristics

Sociodemographic characteristics	Studied workers (n=119)	
	N	%
Age (in years)		
(Mean ± SD)	41.6±10.8	
Range	21-67	
Gender		
Male	102	85.8
Female	17	14.2
Residence		
Rural	77	64.7
Urban	42	35
Marital status		
Married	107	89.9
Single	12	10.1
Income		
Enough and saving	14	11.8
Just enough	67	56.3
Not enough	38	31.9

Table (1) shows socio-demographic of workers. It revealed that majority of workers were males with the mean age of (41.775±10.712). Regarding their educational level 49.6% could read and write.

Table 2: Distribution of studied workers according to duration of work

Work related data	Studied workers (n=119)	
	n	%
Duration of work (in years)		
≤10	48	40.3
11-20	27	22.7
21-30	38	31.9
≥31	6	5
Mean ±SD	16.16±9.6	
Range	1-40	

Table (2) shows distribution of studied workers according to work duration. It revealed that the experience of work among workers ranged from (1-14).

Table 3: Distribution of studied workers according to type of exposures

Type of exposure	Studied workers (n=119)	
	N	%
Gases	88	73.9
Dust	50	42.2
Humidity	67	56.3
Heat	100	83.3
Noise	119	100
Vibration	26	21.8
Inadequate light	119	100

Table (3) show the distribution of studied workers according to type of exposures. all workers were exposed to Inadequate light (100%) and noise (100%), followed by heat and gases among nearly three fourths of exposed workers (83.3% - 73.3%) respectively.

Table 4: Availability of Personal Protective Equipment among studied workers

PPE	Studied workers (n=119)	
	Yes	%
Masks	78	65.5
Eye goggles	0	0
Face cover	0	0
Gloves	119	100
Apron	0	0
Over shoes	0	0
Ear plugs	26	21.8
Head gear	0	0

Table (4) show distribution of PPE among studied workers. Regarding masks and gloves they were available for all workers (100%), on the other hand ear plugs were unavailable for more than half (59.2%) Of them.

Table 5: Distribution of personal protective equipment usage among studied workers

PPE	Studied workers (n=119)	
	N	%
Mask (n = 78)		
Rarely	10 8	12.7
Sometimes	30	10.3
Mostly	30	38.5
Always		38.5
Gloves (n = 119)		
Rarely	11	9.2
Sometimes	36	30.3
Mostly	64	53.8
Always	8	6.7
Ear plug (n = 26)		
Rarely	5	19.2
Sometimes	4	15.4
Mostly	11	42.3
Always	6	23.1
Instructions for the right using		
Regularly	112	94.1
Irregularly	7	5.9
PPE supervision	106	89.1

Table (5) demonstrates distribution of Personal Protective Equipment Usage among studied workers. (38.5%) of workers always used masks, and (38.5%) of them mostly used gloves. Most of the study group took the right instructions of use of PPE (94.1%), and PPE supervision (89.1%).

Table 7: Medical examinations and investigations among studied workers

Medical examinations and investigations	Studied workers (n=119)	
	N	%
Preplacement medical examination		
Yes	99	83.2
No	20	16.8
Periodic-medical examination		
No	27	22.7
Yes	92	77.3

Table (7) shows Medical examinations and investigations among studied workers. It shows that the majority (83.2%)

had pre placement medical examination.

Table 8: Distribution of the studied workers according to past medical history

Past medical history	Studied workers (n=119)	
	N	%
Hypertension	37	30.8
Diabetes	24	20.2
Cardiac	17	14.3
Renal	18	15.1
GIT	8	6.7
C.N. S	7	5.9
Ophthalmic problems	34	28.3
Skin problems	31	26.1
Musculoskeletal disorders	34	28.6
Chest manifestations	56	47.1
Auditory manifestations	49	41.2

Table (8) shows Distribution of the studied workers according to past medical history.

Table 9: Anthropometric measurements and blood pressure among the studied workers

Studied variables	Studied workers (n=119)
Weight (kg)	89.8±13.2
Mean ± SD	60_120
Range	
Height (Cm) Mean ± SD	173.2±7.4
Body Mass Index BMI (kg/m ²)	30±4.5
SBP (mmHg)* Mean ± SD	139±19.2
DBP (mmHg)# Mean ± SD	88.4±12.3

*SBP: Systolic blood pressure #DBP: diastolic blood pressure

Discussion

This cross-sectional study was conducted at New Delta Plastic Company in Tanta city, Gharbyia Governorate, Egypt. This study was conducted on 119 workers as the exposed group and 28 workers as the non-exposed group. The primary goals of this research were to determine the prevalence of auditory and respiratory issues among plastic plant employees and conduct an audit of the working conditions and safety measures in accordance with OSHA standards.

Our study revealed (as shown in table 1) that majority of workers in studied (85.8%), groups were males with the mean age of (41.6±10.8). In agreement with the current study Salem *et al.*, in Egypt 2017, [6] compared a control group of 60 people who were not exposed to the radiation to 180 people who were exposed while working in a plastics industry in the Quesna industrial zone of the Menoufia governorate in Egypt. In terms of sociodemographic variables, no statistically significant difference was found between the two sets of

data.

Also, Helal *et al.*^[7]. In 2013 recruited 40 male employees from Egyptian plastic companies; the participants' ages ranged from 18 to 33 (mean \pm standard deviation = 4.09). Fifty healthy males (23.4 ± 4.05) who were not exposed to the experiment served as a control group. Their ages ranged from 21 to 35. Neither group differed significantly from the other in terms of smoking behavior, age, sex, or socioeconomic level.

However, Ogunkoya *et al.*,^[8] there were a total of 190 participants in the study, 95 of them were plastic manufacturing workers and 95 served as controls. The average ages of the two groups were 30.27 ± 7.38 and 25.92 ± 4.63 , respectively ($t = 4.877$; $p < 0.001$). A total of 67 females and 27 males made up the control group, while 68 females and 28 males constitute the study group. In terms of height ($p = 0.059$), weight ($p = 0.311$), marital status ($p = 0.338$), and sex ($p = 0.873$), the research group and the controls did not vary statistically.

The current study (as shown in table 3) revealed that In the exposed group, all workers were exposed to Inadequate light and noise (100%), followed by heat, and gases among nearly three fourths of workers (83.3% - 73.3%) respectively.

Literature showed that the workers at the Plastic Factories were exposed to plastic fumes^[8], Styrene^[6, 9], noise^[10] and polyvinyl chloride^[6].

The current study revealed that (as shown in table 8) there were 30.8% of workers suffered from hypertension, diabetes (20.2%). while skin problems and ophthalmic problems were (26.1%, 10.7%) respectively

In concordance with the current study Abdel-Rasoul *et al.*,^[11] in Menoufia Governorate, Egypt showed that In comparison to the control group, employees at plastic factories were far more likely to experience chest and auditory manifestations, worse spirometric measures, and abnormal audiometric findings.

However, El-Sherif and Abdelrafaa,^[9] showed the prevalence of hearing impairment was higher among exposed compared to control groups, but without statistical significance.

Also, Salem *et al.*,^[6] in Menoufia Governorate, Egypt showed Compared to the control group, those who were exposed had a significantly higher prevalence of heartburn and diarrhea ($p < 0.05$). The exposed group had a considerably higher incidence of hemorrhage from gums, from orifices, and ecchymosis compared to the control group ($p < 0.05$).

Our study (as shown in table 9) revealed that the exposed group were tall, weight, BMI, and blood pressure.

Consistent with the recent study Das *et al.*,^[12] in Gazipur, Bangladesh revealed that there was no statistically significant difference between blood pressure of plastic factory workers before and after joining in the factory.

However, Ogunkoya *et al.*,^[13] in Southwest Nigeria and Sati *et al.*,^[14] revealed that was no significant difference between study and control groups as regard weight and height.

Conclusion

Working conditions in plastic industry pose several high risks for workers' health. The results of the study showed that which resulted in harmful effects. There was a clear lack of compliance with personal protective equipment

usage among personnel.

Recommendations

Based on the findings of the present study

- Education of workers about health problems and hazards in the metal working industry and periodic training programs on safe work practice.
- Using personal protective equipment as well as prohibit smoking in the workplace.

Conflict of Interest

Not available

Financial Support

Not available

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