



Health effects and complaints among sample residents who live close to petroleum plants in El Brega, Libya

Salah A. Gadalla*, Wafa A. Hamad, Samah F. Abdelwahab, Asma M. Muhammed, Dalal F. Muhammed

Department of Environmental Health, Faculty of Public Health, University of Benghazi, Benghazi, Libya

Highlights

- The residents who live in the petroleum industries area showed significant increase in the prevalence of complaints include acute respiratory, psychological, eye and dermal problems.
- There was a significant increase in prevalence of health complaints among males.

ARTICLE INFO

Article history:

Received 26 June 2018

Revised 28 August 2018

Accepted 24 November 2018

Available online 26 December 2018

Keywords:

Petroleum emissions, Natural gas refineries, Petroleum gases, Impacts of oil refineries emissions.

*corresponding author:

E.mail: Salah78gadalla@gmail.com

S. A. Gadalla

ABSTRACT

Petroleum emissions from refineries include a variety of metals and many types of gases which are recognized as carcinogenic and which cause adverse health problems as well. For many years, residents of rural areas who live in proximity to petroleum plants in some countries have complained of adverse health problems, which linked with gas emissions from nearby natural gas refineries. The aim of the study to know the percentage of health complaints and acute symptoms among residents sample. The study made on a random simple sample of residents who live close to petroleum plants in El Brega city. The data were collected from members of residents by using self-administered questionnaire which including questions on demographic and generic health and the health problems they may have. The results showed a high percentage of acute respiratory symptoms in the age group 45-65 years especially respiratory symptoms including a cough, wheezing, and difficulty in breathing with a percentage of 58% of participants. Participants who aged from 30 to 44 years is most likely are suffering from dermal reactions with a moderately high percentage, which is 61.5%. Conclusion: Our study showed excess in the prevalence of many acute respiratory health problems and complaints from petroleum emissions among members of the samples of residents.

© 2018 University of Benghazi. All rights reserved.

1. Introduction

Petroleum emissions from refineries include a variety of metals and many types of gases which are recognized as carcinogenic and which cause adverse health problems (Ramiset *et al.*, 2012). For many years' residents of rural areas who live close to petroleum plants in many countries have complained of adverse health problems which linked to gas emissions from nearby natural gas refineries (Spitzeret *et al.*, 1989).

The accelerated development of industrial activities during the past century had stimulated many concerns about the potential environmental health effects that might be resulted from those activities. It was estimated that seven million global deaths every year have resulted from air emissions (Burki, 2014).

Unfortunately, the lack of strict environmental controls, preventive precautions, and public health systems in the developing countries, industries have moved in recent decades from the developed to the developing countries, affecting environment and health (McMichael, 2000).

A report has recently issued by the World Health Organization showed that 25% of the mortality in the developing countries is related to environmental causes (Schwartz, 2004).

Residents who live in proximity to major industrial areas are facing complex situations of exposure to environmental hazards, multi-exposure to chemicals combined with exposure to dust, visual pollution, stress and so forth which possible associated with health risks, are of highest concern to the residents (Pascal *et al.*, 2013)

Many studies have shown an association between petroleum emissions and their effect on cancer but without statistical signifi-

cance. A recent Swedish study over a region with high concentration of petrochemical industries showed no excess of risk for lung, leukemia, lymphoma, liver or central nervous system cancer (Axelsson *et al.*, 2010)

During the year 2007, the Spanish refineries released around 100,000 tons of pollutants, half of which are classified as hazardous (Ramiset *et al.*, 2012). Another study in the UK, a region with large industrial activity including petrochemical complexes was compared with a region with no industry but similar socio-economical characteristics. The industrialized area showed an increase in the risk of lung cancer in women (Bhopal *et al.*, 1998).

Our study was carried out in March 2017 on residents of El Brega in seven petrochemical industries, which include natural gas factory, petroleum refinery, tow ethanol factories, two urea factories, and pressurization gas factory. The above-mentioned factories emitting gases including Hydrogen sulfide, Carbon oxides, offensive fumes and odors, sulfur oxides, dust, hydrocarbons, ammonia and nitrogen oxides as mentioned in the interview, which was made with administrative workers in the company of Sirte Oil for Production and Industry of Oil and Gas, which had those factories. Our study aims to investigate health complaints and acute symptoms among residents sample with disregarding the medical history.

2. Methods

The target population of the cross-sectional study is the residents who live close to the industrial area in El Brega city. The workers in petrochemical factories have been excluded from the study because in the present study we focus on community expo-

sure. The subjects of the study had different demographic characteristics. The sample has been selected randomly of residents who live in Sirte Oil Company complex.

Information was collected by self-administered questionnaire on demographic characteristics, risk factors such as cigarette smoking, respiratory diseases and illnesses. Cardinal symptoms included respiratory symptoms such as a cough, pain during breathing, and irritations of upper respiratory airways. Besides, questions about dermal problems such as itching, burning, and dermatitis or irritation. The questionnaire includes questions on irritation of eyes, and complaints from offensive odors. The questions are close end questions to be responded by yes or no. The medical history and the years of residence are not included in the questionnaire because mostly focus on acute health problems.

Theoretical information had been collected from authentic websites and databases such as Pub Med and Google Scholar for purposing of getting relevant articles. Searching in the webs has been made by using keywords such as oil, petrochemical emissions, hydrogen sulfide, nitrogen oxide, hydrocarbons, and impacts of **Table 1**

Proportions and frequencies of respiratory health problems according to age group, gender, and cigarette smoking.

Age group	Smoking		Respiratory chronic diseases: bronchitis, asthma, and allergic rhinitis		Respiratory acute symptoms cough, wheezing, and pain during breathing.		Nose irritations and red nose			
	Freq	%	Freq	%	Freq	%	Freq	%		
15-29	18	24	4	33.3	1	7.7	0	0	1	8.3
30-44	16	21.3	4	33.3	3	23.07	8	42	5	41.7
45-65	41	54.7	4	33.3	9	69.3	11	58	6	50
Total	75	100	12	100	13	100	19	100	12	100
Gender										
Male	65	86.7	12	100	10	77	16	84	11	92
Female	10	13.3	0	0	3	23	3	16	1	8
Total	75	100	12	100	13	100	19	100	12	100

Table 2

Proportions and frequencies of complaints from a dermal eye and offensive odors of emissions according to age and gender.

Age group	Psychological reactions to and complaints to offensive odors of Gases, fumes, and dust		eye Irritations, red eye		Skin irritations, rash, and redness.	
	Freq	%	Freq	%	Freq	%
15-29	9	20	3	14	0	0
30-44	11	25	5	23	8	61.5
45-65	24	55	14	63	5	38.5
Total	44	100	22	100	13	100
Gender						
Male	39	88.6	19	86	11	84.6
Female	5	11.4	3	14	2	15.4
Total	44	100	22	100	13	100

4. Discussion

The displayed results in **Table 1** show high percentages of respiratory symptoms in the age group 45-65 years especially respiratory symptoms including cough, wheezing, and difficulty in breathing with percentage of 58% of participants. A study by [Kongtip et al. \(2013\)](#) was conducted on people living near petrochemical industrial estate in Thailand in 2012: the results showed that people had acute respiratory adverse health effects, shortness of breath, cough, nose congestion, and sore throat from exposure to petrochemical emissions. Similarly, another study was conducted in the same country, which is Thailand: the results showed that adults aged ≥ 40 years were more likely had respiratory health effects than those who aged <40 years ([Tanyanont et al., 2012](#)).

petrochemical emissions, and impacts of petroleum emissions. Data analysis: data had been input into Microsoft Excel to calculate percentage of health problems and complaints.

3. Results

The total number of questionnaires, which were distributed, is one hundred questionnaires: seventy-five of them were returned from participants. Therefore, the response rate was 75%. The responded participants had been classified according to age into three age groups, which are 15-29 yrs, 30-44 yrs, and 45-65 yrs age groups.

Age groups, which are included in this study ranging from 15 to 65 years. From **Table 1** all percentages of smokers are equal in all age groups. Males make the highest proportion of participants with the percentage of 86.3% while the female proportion is 13.7 percentage. Therefore, the sample is gender biased since the majority of respondents were males forming 86.7%. For this reason, focusing on the age as a demographic factor was the right choice.

[Spitzer et al., \(1989\)](#) carried out a study on residents of a region containing the contiguous communities of Twin Butte, Glenwood, Mountain View, Hill Spring, willow Greek and a portion of Pincher Greek that was exposed to emissions of the two sour gas processing plants in Canada. The results of the previous study showed that percentage of wheezing or crackling sounds in lungs 2.8%, Nasal symptoms 22 %, shortness of breath 24%, and red nose is 13%. The above-mentioned supports our findings that residents who live close to petrochemical plants had acute respiratory symptoms.

Participants of 45-65 age group had a particular respiratory chronic disease, which is bronchitis with the percentage of 69.3%. In addition, 33.3 % of this age group is smoking, while participants of age group of 15-29 years do not have any type of neither acute respiratory symptoms nor chronic respiratory disease. The displayed results in **Table 1** show that male participants have a higher

percentage of respiratory symptoms with percentage 84% of the symptoms of a cough, wheezing and difficulties in breathing than female participants do. Besides, 77% of the males are suffering from bronchitis of the participants in contrast to the study, which carried out, by Tanyanont and VichitVadakan (2012) which showed that females were more likely to have dyspnea, wheezing and upper respiratory adverse health effects than males who live close to the petrochemical complex.

The indicated results in Table 2 show a high percentage of participants frequently were complaining from offensive odors of emitting gases particularly who aged more than 40 years (age group: 45 to 65 years with a percentage of 55%). Similarly, the study of Tanyanont and VichitVadakan (2012) reported complaints from odors among residents who live close and in downwind is more frequently than residents who live farther from the petroleum complex. Otherwise, as had been suggested by Luginaah et al., (2002), who projected that residents' sensitivity to the negative impacts of the petrochemical emissions that lead to psychological reactions, is associated with perceived petrochemical emissions.

The results shown in Table 2 indicated a high frequency of eye irritations among subjects of age group 45-65 years with the percentage of 63%. Most likely, Subjects who aged ≥ 40 years were more likely to have eye irritation than those aged < 40 years (Tanyanont et al., 2012).

The presented results in Table 2 showed that participants who aged from 30 to 44 years are most likely are suffering from dermal reactions with a moderately high percentage, which is 61.5%. In the study conducted by Spitzer et al. (1989) the results showed that percentages of complaints reported from red eye and impaired visual acuity, rash, and dermatitis are 10.7, 9.4, 3.8, and 2.7 respectively (Spitzer et al., 1989). It is important to remember the study was done not to study the causative association between petroleum emissions and health complaints but to investigate the proportion of these complaints among residents who live in close to petroleum factories.

5. Conclusion

Our study showed excess in the prevalence of many acute respiratory health problems and complaints from petroleum emissions among members of the samples of residents.

6. Recommendations

- 6.1. Implementation of odor reduction initiative on the part of the refinery operators.
- 6.2. Periodic examination to measure the concentration of chemicals in the human body.
- 6.3. Communities near Oil Refineries must demand cleaner air.
- 6.4. Employers in the oil and gas industry must develop and conduct a written exposure control plan (ECP) whenever your workers may be exposed too much to chemical hazards; an effective plan gives a detailed approach to protect workers against chemical exposures.

- 6.5. The necessity of making of environmental circles in the places of refineries to procedure continual periodic detections on the refineries to observation the pollution cases that found.
- 6.6. Knowledge the special environmental boundaries in the awareness of air and gas emission in refineries and the places near it and comparison it with the environmental boundaries.
- 6.7. Establish clinic for respiratory diseases in communities close to oil refineries.

References

- Axelsson, G., Barregard, L., Holmberg, E., Sallsten, G. (2010) 'Cancer incidence in a petrochemical industry area in Sweden. *Sci Total Environ*', 408, pp. 4482-4487
- Bhopal, R., Moffatt, S., Pless-Molloli, T., Phillimore, P., Foy, C., Dunn, C., Tate, J. (1998) 'Does living a constellation of petrochemical, steel, and other industries impair health?', *Occup Environ Med*, 55, pp. 812-822
- Burki T. K. (2014) 'Twice as bad: new estimates for mortality from air pollution', *Lancet Respir Med*, 2, pp. 355.
- Kongtip, P., Singkaew, P., Yoosook, W., Chantanakul, S., Sujiratat, D. (2013) 'Health effects of people living close to a petrochemical industrial estate in Thailand', *J. Med Assoc Thai*, 96, Suppl 5, pp. 64-72
- Luginaah, I. N., Taylor, S., Elliot, S., Eyles, J. (2002) 'Community re-appraisal of perceived health effects of petroleum refinery', *SocSci Med*, 55, 1, pp. 47-61.
- McMichael A. J. (2000) 'The urban environment and health in a world of increasing globalization: issues for developing countries', *Bull World Health Organ*, 78, pp. 1117-1126.
- Pascal M., Pascal, L., Bidondo, ML., Cochet, A., Sarter, H., Stempfelet, M., Wagner, V. (2013) 'A review of the epidemiological methods used to investigate the health impacts of air pollution around major industrial areas', *J Environ Public Health*: 7373926. doi: 10.1155/2013/737926. Epub 2013 Jun 2.
- Ramis, R., Diggles, P., Boldo, E., Gracia-Perez, J., Femendaz-Navarro, P., Lopez-Abente, G. (2012) 'Analysis of matched geographical areas to study potential links between environmental exposure to oil refineries and non-Hodgkin lymphoma mortality in Spain', *International Journal of Health Geographics*, 11, pp. 14
- Schwartz J. (2004) 'Air pollution and children's health', *Pediatrics*, 113, pp. 1037-1043
- Spitzer, O. W., Dales, R., Schechter, M., Suissa, S., Tousignant, P., Steinmetz, N., Hutcheon, M. (1989) 'Chronic exposure to sour gas emissions: meeting a community concern with epidemiologic evidence', *CMAJ*, 141, pp. 685-692
- Tanyanont, W., Vichit-Vadakan, N. (2012) 'Exposure to volatile organic compounds and health risks among residents in an area affected by a petrochemical complex in Rayong, Thailand', *Southeast Asian J Trop Med Public Health*, 43(1), pp. 201-211