

HEALTH COMPLAINTS AMONG SUBJECTS INVOLVED IN OIL CLEANUP OPERATIONS DURING OIL SPILLAGE FROM A GREEK TANKER “TASMAN SPIRIT”

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Abstract

Background: Oil spillage in the sea water is a disaster for marine life and humans in the vicinity. The study aimed at investigating health complaints among subjects involved in oil cleanup operations during a spillage from a Greek oil tanker “Tasman Spirit”. **Subjects and Methods:** The project was conducted under the supervision of the Department of Physiology, College of Medicine, King Khalid University Hospital, King Saud University, Riyadh, Saudi Arabia. The study concerned the respiratory and general health complaints in 50 apparently healthy, non-smoking male workers exposed to crude oil during oil cleanup operations. The exposed group was matched with a similar number of male, non-smoking controls. The health complaints were evaluated based on a comprehensive interview. **Results:** The subjects involved in oil cleanup operations had significantly higher rates of health complaints including cough (38%), runny nose (36%), eye irritation/redness (32%), sore throat (28%), headache (28%), nausea (24%) and general illness (18%), compared to their matched controls. **Conclusion:** Air pollution due to crude oil spillage into sea water may cause respiratory and general health complaints in workers involved in oil cleanup operations.

Key words:

Oil spill, Tasman Spirit, Respiratory findings, Health complaints, Greek oil tanker

INTRODUCTION

The sea ports are the most productive and populated spots on earth but, unfortunately, they are also likely to face a variety of natural hazards such as hurricane strikes (e.g. Katrina or Rita) or tsunami following the earthquakes,

as well as other disasters, like oil spills. Oil spillage into the sea results in severe pollution of marine environment. A number of oil spill incidents have been recorded during the transportation of crude oil [1–5]. A famous example is the spillage from a Greek oil tanker, the “Tasman Spirit”,

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carrying approximately 67 535 ton of crude oil, which ran aground in the channel of the Karachi port, Pakistan, and sustained a hull damage that ruptured the tanker. During the following week, an estimated 28 000 ton of crude oil spilled into the sea and started coming ashore. Air pollution resulted from the release of approx. 11 000 ton of volatile organic compounds (VOCs) that had entered the air after the spillage. The VOCs sampled at various areas surrounding the city ranged from 44 ppm to 179 ppm. A pungent odor was reported and mist vapor was perceptible at a distance of about 2–4 km from the beach area. The residents and workers were exposed to VOCs at 40 to 170 ppm [6].

Crude oil is a combination of various chemical compounds, including mainly para-phenols and aromatic hydrocarbons [7–8]. Among the aromatic hydrocarbons, of toxicological interest are benzene, alkyl benzene and polycyclic aromatic hydrocarbons (PAHs) [9] along with trace amounts of metals [7]. PAHs show a higher concentration in the blood and lower in the brain, liver and kidney and since they have a tendency to accumulate in adipose tissues [10], the crude oil spill is potentially hazardous to health [11].

Crude oil spillage in the sea is thought to produce health effects including cough, shortness of breath, sore throat, runny nose, asthmatic attacks, redness of eyes, nausea, vomiting, abdominal pain, diarrhoea, headache, dizziness, back and leg pain [2,11,12].

The aim of the present study was to investigate the health complaints reported by the workers involved in oil cleanup operations during the spillage from the Greek oil tanker “Tasman Spirit” in order to make the occupational, environmental and marine health professionals aware of the nature and severity of the possible health effects associated with such exposure.

SUBJECTS AND METHODS

The study was conducted under the supervision of the Department of Physiology, College of Medicine, King Khalid University Hospital, King Saud University, Riyadh, Saudi Arabia, between July 2003 and December 2004. The study protocol was approved by the Ethical Committee of The College of Medicine, King Saud University.

Subjects

This study was commissioned immediately after the incident. The investigators visited the coastal areas of Karachi, Pakistan, observed the situation onsite and conducted an interview with 115 subjects who were engaged in oil cleanup operations at Clifton beach, Karachi, for at least 8–10 h a day for six days a week. These workers were wearing a simple, cloth-made, nose and mouth mask as a protective measure. A temporary shelter was built on the Clifton beach, where the participants were interviewed. The principal investigator, Professor Meo, conducted a comprehensive interview, based on a standardized questionnaire, including a general introduction, family history, job description, smoking habit, tobacco chewing habit, and respiratory and general health complaints. Eventually, 50 subjects were admitted to the study group.

This interview was also used to select the control group. A total of 80 subjects were interviewed and finally 50 healthy males were enrolled in the study as matched controls. The control group was composed of clerical staff, shopkeepers and salesmen who lived at a distance of about 15–20 km from the coastal belt.

Exclusion criteria

Subjects with a history of gross anemia, diabetes mellitus, pulmonary tuberculosis, bronchial asthma, chronic bronchitis and malignancy were excluded. Drug addicts, cigarette smokers, subjects exposed in any industry which generated smoke and dust, and subjects working at petrol pumps and gas stations were also not considered in the study [13].

Statistical analysis

The odds ratio was computed with a 95% confidence interval, and using GraphPad InStat, 4.0 software.

RESULTS

Table 1 summarizes the respiratory health complaints among the workers involved in oil cleanup operations (study group) and in their matched controls.

Table 1. Respiratory health complaints in subjects exposed to crude oil vs. controls

Clinical symptoms	Subjects exposed to crude oil (n = 50) %	Controls (n = 50) %	OR	95% CI	Significance level
General illness	9/50 (18%)	0/50 (0%)	30.46	1.7–542.2	0.0004
Cough	19/50 (38%)	3/50 (6%)	9.60	2.61–35.22	0.0002
Sputum	4/50 (8%)	1/50 (2%)	4.26	0.46–39.57	NS
Shortness of breath	7/50 (14%)	1/50 (2%)	7.98	0.94–67.5	NS
Wheezing	03/50 (06%)	0/50 (0%)	7.44	0.38–148.0	NS
Chest tightness	4/50 (8%)	0/50 (0%)	9.77	0.51–186.7	NS
Sore throat	14/50 (28%)	3/50 (6%)	6.09	1.6–22.8	0.006
Runny nose	18/50 (36%)	2/50 (4%)	13.5	2.9–62.2	0.0001
Asthmatic attacks	4/50 (8%)	0/50 (0%)	9.77	0.51–186.7	NS

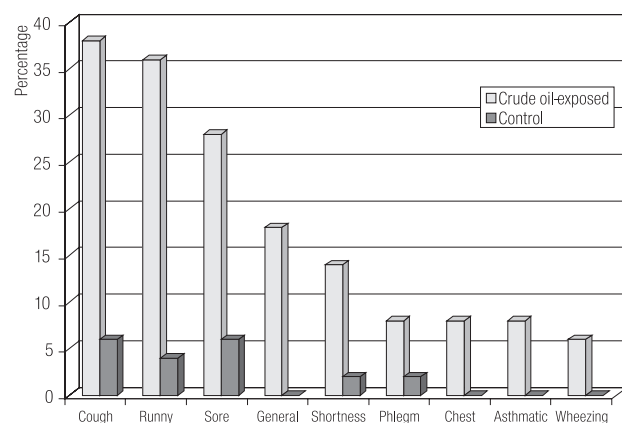
OR — odds ratio.

95% CI — 95% confidence interval.

NS — non-significant.

The subjects showed a higher rate of cough (38%), runny nose (36%), sore throat (28%), general illness (18%), shortness of breath (14%), chest tightness (8%), phlegm (8%) and wheezing (6%), compared to controls.

Table 2 demonstrates the frequency of symptoms among individuals involved in oil cleanup operations compared to that in the control group. The exposed group complained of eye irritation/redness (32%), headache (28%), nausea (24%), itching skin (14%), vomiting (8%), diarrhoea (4%), abdominal pain (2%) and fever (6%) (Table 2, Fig. 2).

**Fig. 1.** Respiratory health complaints among subjects exposed to crude oil vs. controls.**Table 2.** Health complaints among subjects exposed to crude oil vs. controls

Clinical symptoms	Subjects exposed to crude oil (n = 50) %	Controls (n = 50) %	OR	95% CI	Significance level
Eye irritation/redness	16/50 (32%)	1/50 (2%)	23.06	2.9–182.3	0.0001
Itchy skin	7/50 (14%)	1/50 (2%)	7.98	0.94–67.5	NS
Fever	3/50 (6%)	0/50 (0%)	7.44	0.38–148.0	NS
Nausea	12/50 (24%)	2/50 (4%)	7.98	1.6–35.9	0.007
Vomiting	4/50 (8%)	0/50 (0%)	9.77	0.51–186.7	NS
Diarrhoea	2/50 (4%)	0/50 (0%)	5.2	0.24–111.3	NS
Abdominal pain	1/50 (2%)	0/50 (0%)	3.06	0.12–77.0	NS
Headache	14/50 (28%)	2/50 (4%)	9.33	1.99–43.7	0.002

OR — odds ratio.

95% CI — 95% confidence interval.

NS — non-significant.

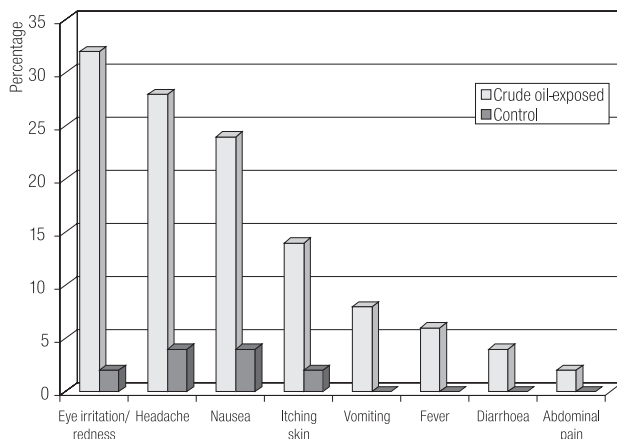


Fig. 2. General health complaints in subjects exposed to crude oil vs. controls.

DISCUSSION

Oil spills during maritime transport of crude oil products are still an important source of marine pollution, especially along major transport routes. A severe oil spill into sea water represents an environmental disaster for marine life and poses health hazards to humans in the vicinity. The present study was designed to evaluate the health complaints reported by workers involved in oil cleanup operations during the grounding of the Greek oil tanker *Tasman Spirit*. The health complaints noted in the present study are similar but their prevalence is higher than in the other reports on health effects of major oil spills. Crum [14] demonstrated that individuals exposed to crude oil at the grounding of the *Braer* oil tanker developed headache, irritation of the eyes, throat and skin. Similarly, Campbell et al. [15] noted that the exposed group experienced symptoms of bruising, unsteadiness, weakness, cramps, eyesight problems, wheezing and breathlessness. Lyons et al. [2] reported general illness, headache, nausea, vomiting, diarrhoea, sore eyes, runny nose, sore throat, cough, itchy skin, shortness of breath, anxiety and depression. Similarly, Morita et al. [12] discussed acute health effects among people engaged in the cleanup of the *Nakhodka* oil spill and found that the exposed group developed back and leg pain. Moreover, Jan-Paul et al. 2007 [16] reported that the risk of developing symptoms increased with the level of exposure from oil spillage. A significant dose-related trend was seen when the number of days, and the average

number of hours of daily activities were considered. The authors observed that the prevalent respiratory symptoms among male workers were wheezing with breathlessness (9.6%); shortness of breath (10.3%); chronic cough (16.1%); chronic phlegm (17.6%); asthma (4.7%); chronic bronchitis (4.6%); nasal allergy or rhinitis (7.9%). Furthermore, Surez et al. [17] and Carrasco et al. (2006) [11] reported the toxic effects including headache, itchy eyes, nausea, vomiting, dizziness, throat and respiratory tract problems and noted that these symptoms were more prevalent among workers who did the cleanup in highly polluted areas. The overall frequency of the health complaints reported by Surez et al. [17] was 8% for headache, 5% for eye symptoms, 10.7% for neuro-vegetative disorders, and 8.1% for the throat and respiratory problems.

In the present study, the subjects involved in oil cleanup operations showed a high prevalence of cough (38%), runny nose (36%), eye irritation/redness (32%), sore throat (28%), headache (28%), nausea (24%), and general illness (18%). In this study, we attempted to minimize the confounding factors by using matched controls, excluding smokers, workers with any previous industrial exposure to dust, fume and oil. Moreover, workplace exposure conditions were approximately consistent for all the exposed subjects.

This study has also some limitations. Firstly, we were constrained to recruit a limited number of subjects (50 in each group) because of the odor of crude oil, a general concern in the community, and a rapid changing of work shifts. Secondly, most of the subjects were workers at the Karachi Municipal Corporation (KMC) who were directed to the disaster site by the administration of Karachi. It should be noted that the KMC workers were already exposed to dust while cleaning the streets and roads and dust is among the causal factors of respiratory health problems [18]. For this reason, the KMC workers were also excluded from the study. Thirdly, the workers were at first unwilling to participate for fear that they would have to go on early retirement if their health condition was found to be impaired. However, when the workers were assured that this type of study can be beneficial to them, they usually

agreed to take part in the project. Considering the above circumstances, we were constrained to recruit 50 subjects in each group.

CONCLUSION

The results of the present study suggest that the subjects involved in oil cleanup operations had a higher rate of such complaints as general illness, cough, runny nose, eye irritation/redness, sore throat, headache and nausea, compared to the control group. These findings indicate that environmental disasters caused by oil spillage incidents lead to a number of health consequences, which should be taken into consideration when the cleanup tasks are being planned and performed. Most of these health effects are due to the physicochemical properties of crude oil, the magnitude of spillage and the nature of the tasks involved. Therefore, appropriate protective measures, such as wearing an apron, hand gloves and long boots, should be undertaken, and respiratory protection equipment, should be provided to the workers engaged in oil cleanup operations. One should also bear in mind that, apart from the respiratory and general health complaints reported in this study, being a witness of such catastrophes may also lead to short- and long-term psychological disorders. Therefore, it is worthy to highlight the need for a serious action on the part of the national/international community and relevant authorities to minimize the number of such environmental disasters and to prevent the adverse, long-term toxicological effects on human health.

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