The Impact Of Israeli Industrial Zone On Environmental And Human Health In Tulkarm City

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أثر المناطق الصناعية الإسرائيلية على البيئة وصحة الإنسان في مدينة طولكرم

Introduction:

In almost all-Palestinian districts, urban air pollution is worsening in rapidly growing cities, more traffic on roads, use of dirty files, reliance on outdated industrial oppresses , growing energy consumption, increasing the number of quarries and stone -cutting factories and lack of industrial zoning and environmental regulations are all contributing in reducing urban air quality and deteriorating public health.

The main sources of air pollution are energy production, transportation and industry. Most of the energy- production facilities are located in Israel and then electricity is imported to Palestine.

This means that air pollution from power stations is negligible in Palestine, however, other pollution source including quarries, chemical, textile, leather, plastic, painting, building constriction and several other industries are considered as the major source of pollution [1].

Dense vehicular traffic is also a major contributor to air pollution, causing high nitrogen oxide (NOx) concentrations, especially in the heavily populated urban centers . The problem is irritated by the operation of diesel-power buses and trucks.
Increased motorization has had a major impact on the deterioration of air quality.
In Tulkarm district most industries are is the early stage and contribute little to the deterioration air quality except for stone - cutting factories, which is expected to produce large quantities of micro suspended particles.

Moreover, due to the location of the Tulkarm City near the borders with "Israel", high amounts of pollutants emitted from industrial areas in "Israel" reach this district and complicate the problem of air pollution there. Many Israel industrial villages (Kibbutzim), which contain dense, industrial activities, are located near Tulkarm district. They emit their pollutants into the atmosphere due to the absence of safety measures in these industries like filtration, which implies large quantities of fine dust or metallic dust spreading in the area. In addition to that the "Israel" government moved several industries during late 1980 next to residential areas west of Tulkarm city.

The creation of this zone worsens the situation in the area and the current study aimed to evaluate its impact on human health and to asses the possible hazardous of Israeli industrial zone on human health in target area, also to shed light on major causes of disease borne due to air pollution on the target zone in comparison to control area zone.

Methodology:

1-Study population

The study included 250 families residing in a heavily affected area in the west of Tulkarm and 200 families residing in Shweekeh village around 3km away from pollution site and dose not host any polluted industry as control Data regarding personnel heath were

collected, by the employees of the Ministry of Environmental Quality Authority (Tulkarm District), using a specially designed questionnaire

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***2*-Statistical analysis**

Collected data were analyzed using the SPSS (Statistical Package for Social Studies). Frequencies, k^2 and Peareid's samples (T test) were calculated and a comparison was made between study population and the control group. Data were represented in tables and-illustrated when necessary in diagrammatic form.

Results:

Data presented in Table 1 shows sample distribution according to family size in both study and control groups. This distribution pattern is in agreement with published data by the Palestinian Bureau of Statistics in 1996 were more than 70% of the population with 9 individuals or more.

Table 1. Distribution of study and control groups according to family size

Family Size	No. and Frequency Study sample	No. and Frequency Control Group
3.00	96 (12.8%)	36 (1.80%)
4.00	24 (2.40%)	48 (2.50%)
5.00	10 (0.80%)	80 (4.20%)
6.00	30 (2.00%)	48 (2.50%)
7.00	42 (2.40%)	28 (1.50%)
8.00	88 (4.40%)	80 (4.20%)
9.00	234 (10.4%)	144 (7.6%)
10.0	630 (25.2%)	560 (29.6%)
11.0	165 (6.00%)	132 (7.00%)
13.0	312 (9.60%)	208 (11.0%)
14.0	840 (24.0%)	532 (28.1%)
Total	2471 (100%)	1896 (100%)

Data presented in table 2 shows the percentages and frequencies of various disease symptoms among males and females of both study and control groups. Out of2471 studied cases, 188 (7.6%), 105 (4.20/0) and 84 (3.5%) were represented with respiratory, skin and eye disease related symptoms, respectively. In comparison out of 1896 cases of control group, 46 (2.4%), 78 (4%) and 66 (3.5%) were represented with respiratory, skin and eye disease related symptoms, respectively. Data presented in the same table shows that females were represented with a high frequency regarding respiratory related disease symptoms (63.8%) compared to males (36.2%) among the study group, on the other hand males were also represented with a much higher frequency (83%) compared to males (17%) among the' control group. With respect to skin related disease symptoms, among the study group, males showed a higher frequency (62%) compared to females (38%). Similar frequencies were also observed among the control group (64% males to 36% in females). Eye related disease symptoms were represented by (44% and 56%) and (39% and 61 %) for males and females among the study and control groups, respectively.

Table 2. Number and percentage of individuals suffering from respiratory disease related symptoms according to sex among the study and control groups.

Group		Respiratory Related No. (%)	Skin Related No. (%)	Eyes Related No. (%)
Study Sample	Males	68 (36.2%)	65 (62%)	37 (44%)
	Females	120 (63.8%)	40 (38%)	47 (56%)
	Total	188 (100%)	105 (100%)	84 (100%)
	% of total (2471)	7.6	4.2 %	35%
Control Sample	Males	08 (17%)	50 (64%)	26 (39%)
	Females	38 (83%)	25 (36%)	40 (61%)
	Total	46 (100%)	78 (100%)	66 (100%)
	% of total (1894)	2.4	4.0 %	3.5%

Data presented in tables 3, 4 and 5 clearly shows that variations in respiratory related symptoms between study and control groups were statistically significant *(P*= 0.002). On the other hand, variations with respect to skin related disease symptoms between the two groups were also significant *(P*= 0.04), however, eye related disease symptoms were of no significant values *(P* = 0.15).

Table 3. Paired's T test for respiratory related disease symptoms among study and control groups.

Study Group		Control Group		T value	Sig.
Means	St.Deviation	Means	St.Deviation		
0.725	0.447	0.230	0.421	13.96	.002

Table 4. Paired's T test for respiratory related disease symptoms among study and control groups.

Study Group		Control Group		T value	Sig.
Means	St.Deviation	Means	St.Deviation		
0.410	0.493	0.390	0.489	-2.015	.045

Table 5. Paired's T test for respiratory related disease symptoms among study and control groups.

Study Group		Control Group		T value	Sig.
Means	St.Deviation	Means	St.Deviation		
0.340	0.474	0.330	0.471	1.418	.158

Data presented in table 6 represent the association between disease elated symptoms and age groups in both studied groups. Respiratory related disease symptoms, among study group, were most prevalent among the elder age groups < 41(670/0), and followed by the age group 0-10 which was represented by 22.9%. This finding correlates well with the findings regarding the prevalence of respiratory disease related symptoms among the control group.

Both skin and eye related disease symptoms were prevalent among the middle age groups and correlates well in both the study and control groups.

Table 6. Association between disease related symptoms and age groups among t he study and control groups

Age Group	Disease Related Symptoms					
	Study Group			Control Group		
	Respirator Y No.(%)	Skin No.(%)	Eyes No.(%)	Respirator Y No.(%)	Skin No.(%)	Eyes No.(%)
0-10	43 (22.9%)	11 (10.5%)	6 (7.00%)	8(17.4%)	8(10.2%)	2(3.00%)
11-20	13 (6.92%)	9 (8.60%)	2(2.40%)	4(8.70%)	6(7.70%)	2(3.00%)
21-30	06 (3.20%)	32 (30.5%)	9(10.7%)	5(11.0%)	24(30.8%)	8(12.0%)
31-40	00 (0.00%)	21 (20.0%)	38(45.3%)	3(6.50%)	14(18.0%)	30(45.7%)
41-50	72 (38.3%)	22 (21.0%)	26(31.0%)	18(39.0%)	16(20.5%)	22(33.3%)
<51	54 (28.7%)	10 (9.40%)	3(3.60%)	8(17.4%)	10(12.8%)	2 (3.00%)
Total	188 (100%)	105(100%)	84(100%)	46(100%)	78(100%)	66(100%)

Data presented in table 7 shows frequencies and percentages regarding the place of residence specifications for both study and control groups. Based on the answers of the questionnaire, it was clear that the control group is living in a much better environmental conditions with respect to ventilation, size and garden facilities.

Table (7) Specifications of the place of residence in both studied groups

Group	Smell			Smoke			Smoke intensity			Use of Roof			Usage Puposes		Spots on Cloths			Spot Color		
	yes	No	Some	Yes	No	Some	Heavy	Inter	Light	Yes	No	Some	Slee	Cloth	Yes	No	Some	Yellow	Brown	Other
Study	197 78.7%	50 20%	3 1.2%	101 40.4	143 50.2	6 2.4%	36 33.6%	47 44%	24 22.4%	13.2 52.8	112 44.8	6 2.4%	21 15.9%	111 84.1%	116 46.4	110 44%	24 9.6%	41 29.2%	99 70.8%	
Control	38 19%	162 81%	-	28 14%	172 86%	-	8 28.5%	4 14%	16 57.5%	156 78%	42 21%	2 1%	28 18%	128 82%	18 9%	162 81%	20 10%	4 10.5%	34 89.5%	

Based on collected data in the same table, the frequencies of 79.9%, 42.8% and 56% were reported for smell, smoke and the presence of colored spots on cloths, respectively-by families within the affected areas. This is much higher than what was reported by the families of the control group as the frequencies were 19%, 14% and 19% for smell, smoke and presence of spots, respectively. With respect to the color of the spots, the most prominent color was reported to be yellowish and the frequencies of 39.6% and 17% were reported by the study and control groups, respectively. The use of house roof was reported by 55.2% and 79% of the study and control groups, respectively. The use of the roof for the purpose of cloth drying was common in both groups and was represented by 84.1% and 82% for the study and control groups, respectively. The use of the roof for sleeping purposes was reported by 15.9% and 18% by the study and control groups, respectively.

Table 8 shows the frequencies and percentages of symptoms related to respiratory tract in both groups. Difficulties in breathing, asthma, throat infections and nasal obstructions, were represented by 67.5%, 61%, 42.5% and 63.8%, respectively. Out of 188 subjects suffering from respiratory related disease symptoms, (104) 55.3% were reported to visit their physicians and medications were· prescribed for 90% of them. In comparison, the percentages of 54%, 34.7%, 58.6% and 56.5%, were reported by the control group for difficulties in breathing, asthma, throat infections and nasal obstructions, respectively. Out of 46 subjects reported to suffer from respiratory disease related symptoms, (15) 32% were reported to visit their physicians and medications were prescribed for 80% of them.

Table 8. Percentages and frequencies of respiratory disease related symptoms among the studied groups.

Respiratory Symptoms	Study Group		Control Group	
	Yes (No. & %)	No (No. & %)	Yes (No. & %)	No (No. & %)
Difficulty in Breathing	127 67.5%	61 33.5%	25 54%	21 46%
Asthmas	115 61%	65 39%	16 34.7%	30 65.3%
Throat infection	80 42.5%	108 37.5%	27 58.6%	19 41.4%
Nasal & Sinuses Infection	120 63.8%	68 36.2%	26 56.5%	20 43.5%
Clinic Visit	104 55.3%	84 44.7%	15 32%	31 68%
Drug Prescription	94 90%	10 10%	12 80%	3 20%

Data presented in table 9 shows the frequencies and percentages of symptoms related to skin disease in both groups. Presence of pimples or rash and itching were represented by 100% and 37%, respectively. Out of 105 subjects suffering from skin related disease symptoms, (81) 77% were reported to visit their physicians and medications were prescribed for 86% of them. In comparison, the percentages of46% and 270/0 were reported by the control group for the presence of pimples or rash and itching, respectively. Out of 78 subjects reported to suffer from skin disease related symptoms, (53) 67.9% were reported to visit their physicians and medications were prescribed for 73% of them.

Table 9. percentage and frequencies of skin disease related symptoms among the studied groups.

Skin Related Symptoms	Study Group		Control Group	
	Yes (No. & %)	No (No. & %)	Yes (No. & %)	No (No. & %)
Pimples	105 100%	---	36 46%	42 54%
Itching	39 37%	66 63%	21 27%	57 73%
Clinic Visit	81 77%	24 23%	53 67.9%	35 34.1%
Drug Prescription	70 86%	11 14%	38 71.7%	15 28.35%

Data presented In table 10 shows the frequencies and percentages of symptoms related to eye disease in both groups. Infections, inflammation and itching were represented by 83% and 71%, respectively. Out of 84 subjects suffering from eye related disease symptoms, (60) 71% were reported to visit their physicians and medications were prescribed for 88% of them. In comparison, the percentages of 75% and 60.6% were reported by the control group for eye infection and eye inflammation and itching, respectively. Out of 66 subjects reported to suffer from eye disease related symptoms, (58) 87.8% were reported to visit their physicians and medications were prescribed for 87.9% of them.

Table 10. Percentages and frequencies of eye disease related symptoms among the studied groups.

Eye Related Symptoms	Study Group		Control Group	
	Yes	No	Yes	No
Infection	70 83%	14 17%	50 75%	16 25%
Inflammation and itching	60 71%	24 29%	40 60.6%	26 39.4%
Clinic Visit	60 71%	24 29%	58 87.8%	8 12.2%
Drug Prescription	53 88%	7 12%	51 87.9%	7 12.1%

Data presented in table 11 shows the association between the presence smoke in affected families and disease related symptoms.

Out of 188 affected families, of the study group, suffering from respiratory disease symptoms, 69 (36.7%) were reported to observe smoke, while out of 46 affected families of the control group 10 (21.7%) were reported to observe the smoke in their residential areas. With respect to skin related symptoms, out of 105 affected families, of the study group, 44(42%) were reported to observe smoke, while out of 78 affected families of the control group 10 (12.8%) were reported to observe the smoke in their residential areas. On the other hand, out of 84 families with eye related disease symptoms, 56(66.6%) were reported to observe the smoke compared to 12(18%) out of66 families of affected individuals of the control group.

Table 11. Cross tabulation between disease related symptoms and the presence 0f smoke in the residential areas 0 f the studied groups.

Disease related symptoms	Group	Presence of Smoke		K^2	*P* value
		Yes	No		
Respiratory	Study	18 26%	27 39.5%	25.6	0.000
	Control	2 25%	2 25%	17.59	0.000
Skin	Study	18 41%	26 59%	4.47	0.107
	Control	2 25%	2 25%	28.5	0.000
Eye	Study	28 50%	28 50%	37.23	0.000
	Control	4 33.4%	2 16.6%	24.04	0.000

Variations between those who observed the smoke in their residential areas and those who did not were significant *(P= 0.000)* and were in favor of those who did not. This was also the situation among the control group. Variations with respect to eye related disease symptoms were also statistically significant and were in favor those who did not observe the smoke in their residential areas in both the study and control groups. However, such variations were of no significance with respect of skin related disease symptoms.

Data regarding previous history of disease (respiratory, skin and eye) strongly indicates that most of the study group families have no previous history and the percentages of 13.6, 8 and 17.1% were reported for those with previous history regarding respiratory, skin and eye, respectively (data not shown).

Data presented in table 12 shows the association between smoke intensity and disease related symptoms, among those who observe the smoke of the affected families. Out of 69 affected families, of the study group, suffering from respiratory disease symptoms, 18 (26%), 27(39.5%) and 24 (34.5%) were reported to observe heavy smoke, intermediate and smoke of light intensity, respectively. while out of 10 affected families of the control group 2(250/0), 2(25%) and 6(50%) were reported to observe heavy smoke, intermediate and smoke of light intensity, respectively.

With respect to skin related symptoms, out of 44 affected families who observe smoke, of the study group, 18(41%) and 26(59%) were reported to observe heavy smoke and smoke of intermediate intensity, respectively. On the other hand, out of 10 . affected families of the control group 2(25%), 2(25%) and 6(50%) were reported to observe heavy smoke, intermediate smoke and smoke of light intensity in their residential areas.

Furthermore, out of 56 families with eye related disease symptoms, 28(500/0) and 28(50%) were reported to observe heavy smoke and smoke with intermediate intensity, respectively. The control group (12 families), were represented by 4(33.4%), 2(16.6%) and 6(50%) for those who observe heavy smoke, intermediate smoke and smoke of light intensity, respectively.

Variations between those who observe heavy smoke, intermediate and smoke of light intensity in their residential areas and the occurrence of disease symptoms were significant

(P= 0.000) for all studied disease symptoms. These differences were in favor of those who observed smoke with intermediate intensity. There were no significant variations among the control group.

Table 12. Cross tabulation between disease related symptoms and smoke Intensity in residential areas of the studied groups

Disease related symptoms	Group	Dense	Intermediate	Light	K^2	*P* value
Respiratory	**Study**	**18 26%**	**27 39.5%**	**24 34.5%**	**33.04**	**0.000**
	Control	**2 25%**	**2 25%**	**6 50%**	**7.48**	**0.058**
Skin	**Study**	**18 41%**	**26 59%**	**-**	**21.7**	**000**
	Control	**2 25%**	**2 25%**	**6 50%**	**1.13**	**0.77**
Eye	**Study**	**28 50%**	**28 50%**	**-**	**70.4**	**0.000**
	Control	**4 33.4%**	**2 16.6%**	**6 50%**	**4.94**	**0.000**

Discussion

Our data with respect to the association between respiratory disease and air pollution is in agreement with several reports that provided evidence on people living in areas with high levels of pollution. Such people seem to have more respiratory disease related symptoms and worse lung function those living in areas with clean air [31-34] .

Neuralgic dysfunction resulting from carbon monoxide poisoning such as visual impairment , poor learning ability , reduced work capacity , and difficult in performing complex tasks were reported in association with exposure to high CO levels among children [37] • A study conducted between 1980 and 1989 by Goren and Hellmann 38 showed that school children , exposed to air pollution , have a significant increase in the prevalence of asthma . At the same time a significant rise in the prevalence of wheezing accompanied by shortness of breath were reported.

Lead and other heavy metal contaminants are also considered as a serious health. problem among children even at every low doses , as it is associated with IQ deficiencies , reading and learning disabilities , impaired hearing, reduced attention spans , hyperactivity, and antisocial behavior. In metal- contaminated areas, the transport of heavy metals into the home from external sources and their subsequent re-suspension into the air due to normal household activities are significant factors in the exposure to heavy metals, whereas in unpolluted areas indoor sources play the major role [39] • Lead is usually stored in blood, bones, and soft tissues, and can hurt kidneys, liver and the nervous system.

Excessive exposure can cause seizures , mental retardation , and behavioral problems and thus is considered to be very dangerous.

We do believe that lead is a major air pollutant in the study areas as. the Israeli industrial zone is involved paint production in addition to melting of painted materials used for filtration in

agriculture. Thus, lead may account for the finding of high prevalence of respiratory related disease symptoms among younger age groups. Previous studies on the effect of various pollutants emphasize the need of further investigation to measure the effect of air pollution on the nervous system as well as other systems [33].

With respect to place of residence specifications , one can easily deduce that the control group, a rural residential area, are living in a better hygienic condition which could explain the observed variations in prevalence rates of disease related symptoms , in general , compared to the study group. Our finding with respect to house specifications were expected as city living condition are usually worse than that of the rural areas as cities are more crowded and air pollutants are more abundant and this can be reflected from the larger number of vehicles and small industries within cities boundaries [33].

The smell of the air, intensity of smoke and the appearance colored brownish spots are distinguishing features of air contamination in the residential area of the study group .Based on data presented in the questionnaire , one can deduce that episodes of a high level of air contamination occur in that area adjacent to the Israeli industrial zone.

It was also different to judge the situation on the basis of human judgment and not on scientifically designed experimental work. To be specific, measurements of several expected contaminants are required.

To do this monitoring of stations are needed and this requires the collaborative work of both governmental and research institutes. However, one might suggest that nitrogen dioxides (NOx), like nitrogen dioxide (N02) and nitric oxide (NO) were major contaminants as.
reflected by the presence of reddish brown spots on clothing. Such oxide
were reported to produce changes in airway responsiveness; aggravation of existing cardiovascular disease , temporary breathing problems increased susceptibility to respiratory infection and may cause alteration in the lungs [33, 40].

Statistical analysis shows a strong association between the presence and intensity of smoke and the appearance of respiratory disease related symptoms as shown in tables 9 and 10 . Such finding is in support with previous findings on the variations in the prevalence rates of respiratory related disease symptoms in both the study group and the control and emphasizes the hazardous role played by the Israeli industrial zones adjacent to Palestinian residential areas.

The findings on disease symptoms (see table 11) strongly reflect the association of these factors with air pollution (study versus control) Our finding on asthma cases (61% of respiratory diseased related symptoms) strongly indicates the association with air pollution with this disease and is inconsistent with previous reports in this respect" [38 , 41 42] and we would like to add that all asthma cases were confirmed by the medical reports of the concerned cases. Such observation need more detailed attention interest in future studies.

Our findings on the prevalence raters of skin and eye disease related symptoms (table l2), between the study and control groups‹ indicate a week association between the skin and eye disease related symptoms and air pollution . Such finding in consistent with the physiological factions played by these organs compared to the lung

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In general, comprehensive and systematic approaches to identify and estimate population exposures were not used , and the exposure estimates were therefore deemed likely to have great uncertainty.

Unless exposure levels among groups are verified , it cannot be determined whether non-significant associations between exposures and health endpoints indicate a lack of measurable health effect , or are merely a result of exposure misclassification . Site -specific and quantitative exposures assessments are needed to better quantity and infirm exposure 1within such studies , as well as to permit interpretations and comparisons across studies.

Recommendations and Concluding Remarks

1. It is essential that the Palestinian as well as the international community should force the Israeli government to comply to the international laws concerning both regional and global pollution.
2. Future investigation and follow up studies on affected population seems to be essential at this stage
3. The need of medical intervention, diagnosis ,treatment is deemed necessarily to the affected area.
4. Air quality modeling, assessment and planning; development of standards, economic measures and regulations; public education health promotion and information should be a priority for the Palestinian Quality Authority.
5. Encourage industries ready to grasp the challenge and willing to make the change needed to improve the quality of the environment
6. In the absence of a national air quality objective for fine particulates and other pollutants in Palestine, it seems essential at this stage to plan and follow up strategies based on international recommendations in this field.
7. To work on International level to enforce the Israelis to move the Industrial zone into deserted areas or close them.

References

1. WHO, Air Quality Guideline, 1999.
2. Pinatubo M. (1991) Volcano Observatory Team, Lessons from a Major Eruption: Mt. Pinatubo, Philippines, *Eos Transactions,* American Geophysical Union 72, 552-553.
3. Mayer B., Fischer C. A. and Madronich S. (1998) Estimation of surface actinic flux from satellite (TOMS) ozone and cloud reflectivity measurements. *Geophysical Research Letters, 25(23):* 4321-4324
4. Koshland D. E. (1992) The molecule of the year. *Science* ;258:1861.
5. Gaston B., Drazen J. M., Loscalzo J. and Stamler J. S. (1994) The biology of nitrogen oxides in the airway. *Am J Respir Crit Care Med.; 149:538-551.*
6. Flak T. A. and Goldman W. E. (1996) Autotoxicity of nitric oxide in airway disease. *Am J Respir Crit Care Med.;154:S202-S206.*
7. Hgman M., Frostell C. G., Hedenstr m H. and Hedenstierna G. (1993) Inhalation of nitric oxide modulates adult human bronchial tone. *Am Rev Respir Dis.;148:1474-1478.*
8. Frostell C. G., Fratacco M-D., Wain J. C., Zapol W. M. (1991) Inhaled nitric oxide: a selective pulmonary vasodilator reversing hypoxic pulmonary vasoconstriction. *Circulation ;83:2038-2047.*
9. Reiss C. S. and Komatsu T. (1998) Does nitric oxide playa critical role in viral infections? *J Virol.;72:4547-4551.*

10. Sanders S. P., Siekierski E.S., Porter J. D., Richards S. M. and Proud D. (1998) Nitric oxide inhibits rhinovirus-induced cytokine production and viral replication in a human respiratory epithelial cell line. *J Virol.;72:934-942.*
11. www.fwkc.encyclopedia/low/articles/a/a001000750f.html
12. Dasmann, Raymond F. *Environmental Conservation.* 5th ed., Wiley, 1984.
13. www.ucaqll.com.ave/community/bhpal/event/litml
14. Hadshiew I. M., Eller M. S. and Gilchrest B. A. (2000). Skin Aging and Photoaging: The Role of DNA Damage and Repair *Am J Contact Dermat.*11:19-25
15. www.epa.gov/ozone/index.html
16. www.epa.gov/globalwarming.html
17. www.epa.gov/epahome/lawreg.html
18. United Nations Framework Convention on Climate Change (1992) http://www.mct.gov.br/clima/ingles/Default.htm
19. The 1987 Montreal Protocol on Substances that Deplete Ozone Layer. http://www.law.pace.edu/env/russianlaw/text/The%201987%20Montreal%20Protocol%20on%20Substances%20that%20Deplete%2Othe%200zone%20Layer.html?200zone%20Layer.html
20. Dockery D.W. and Pope **III** C. A. (1994) Acute respiratory effects of particulate air pollution. *Annual Rev Public Health;* 15: 10732.
21. Lebowitz MD.(1996) Epidemiological studies of the respiratory effects of air pollution. *Eur Respir J;* 9: 1029-54.
22. Rossi OVJ, Kinula VL, Tienari J, Huhti E.(1993) Associations of severe asthma attacks with weather, pollen, and air pollutants. *Thorax;* 48: 244-48.
23. Gielen M. H., Van der Zee S. C., Van Eijnen J. H., Van Steen C. J. and BrunekreefB. (1997) Acute effects of summer air pollution on respiratory health of asthmatic children. *Am J Respir Crit Care Med* 155: 2105-08.
24. Romieu 1., Meneses F., Ruiz S., et al. (1996) Effect of air pollution on the respiratory health of asthmatic children living in Mexico City. *Am J Respir Crit Care Med;* 154: 300-07.
25. Sporik R., Ingram J. M., Price W., Sussman J. H., Honsinger R. W. and Platts-Mills T. A. E. (1995) Association of asthma with serum IgE and skin test activity to allergens among children living at high altitude. *Am J Respir Crit Care Med;* 151: 1388-92.
26. Boezen H. M., Postma D. S., Schouten J. P., Kerstjens H. A. M., Rijcken B. (1996) PEF variability, bronchial responsiveness and their relation to allergy markers in a random population (20-70 yr). *Am J Respir Crit Care Med;* 154: 30-35.
27. Sears M. R., Burrows B., Flannery E. M., Herbison G. P., Hewitt C. J., Holdaway D. M. (1991) Relation between responsiveness and serum IgE in children with asthma and in apparently normal children. JV *Engl J Med;* 325: 1067- 71.
28. John H. B. A., air pollution Microsoft Encarta online encyclopedia 2000 http Encarta.msn.com 1997-2000 microsoft corporation
29. www.arij.org
30. Pamela K. Levangie Cynthia C. Norkin. (1999) Joint Structuren and Function: A Comprehensive Analysis REV. Publisher: Davis F. A. New York.
31. Desqueyroux H., and Momas I (1999) Air pollution and health: a synthesis of longitudinal panel studies published from 1987 to 1998. *Rev Epidemiol Sante Publique* (Franee), 47(4) p361-75
32. Lis J., Pietrzyk J. J., Klinika C. D., et al., (1997) The effect of air pollution. on the prevalence of asthma in schoolchildren from Krakow. *Pneumonol A!ergo! Pol ;65(9-10):611-20*

33. Monn C., Brandli 0., Schindler C., Ackermann-Liebrich U Leuenberger P. (1998) Personal exposure to nitrogen dioxide in Switzerland. Swiss Study on: Air Pollution and Lung Diseases in Adults. Sci Total Environ 4;215(3):243-51.
34. Huang Y. 1. and Batterman S., (1999) Acute effects of urban air pollution on respiratory health of children with and without chronic respiratory symptoms. Occup Environ Med; 56(12):802-12
35. O'Hollaren M.T., Yunginger J.W., Offord K. P., et al. (1991)Exposure to an aeroallergen as a possible precipitating factor in respiratory arrest in young patients with asthma. N Engl J Med; 324: .63-359
36. Guidotti T. L. (1997) Ambient air quality and asthma: a northern perspective. J Investig Allergol Clin Immunol; 7(1):7-13
37. Amitai Y, Zlotogorski Z, Golan-Katzav V, et al.(1998) Neuropsychological impairment from acute low-level exposure to carbon monoxide. Arch Neurol (United States), 55(6) p845-8
38. Rosas I, McCartney HA, Payne RW, et al. (1998) Analysis of the relationships between environmental factors (aeroallergens, air pollution, and weather) and asthma in Mexico City. Allergy; 53: 394401.
39. Meyer I, Heinrich J, Lippold U (1999) Factors affecting lead‹ cadmium, and arsenic levels in house dust in a smelter town in eastern Germany. Environ Res (United States), 81(1) p32-44
40. Pikhart H, Prikazsky V, Bobak M. et al., (1997) Association between ambient air concentrations of nitrogen dioxide and respiratory symptoms in children in Prague, Czech Republic. Preliminary results from the Czech part of the SAVIAH Study Small Area Variation in Air Pollution and Health. Cent Eur J Public Health;5(2):82-5
41. Dautel PJ, Whitehead L, Tortolero S, et al. (1999) Asthma triggers in the elementary school environment: a pilot study. *J Asthma* (United States), 36(8) p691-702
42. Hurtemann U. (1999) Air pollution and respiratory tract diseases in students. A comparison within Germany *Gesundheitswesen ;* 61(11):536-9