International POPs Elimination Project

Fostering Active and Efficient Civil Society Participation in Preparation for Implementation of the Stockholm Convention

---

Health Status in the Impact Zone of the El Kafr El-Zayat chemical plant

Egypt Sons Association for Development & Environmental Protection

Egypt
March 2006

About the International POPs Elimination Project

On May 1, 2004, the International POPs Elimination Network (IPEN http://www.ipen.org) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;

- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;

- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

For more information, please see http://www.ipen.org

IPEN gratefully acknowledges the financial support of the Global Environment Facility, Swiss Agency for Development and Cooperation, Swiss Agency for the Environment Forests and Landscape, the Canada POPs Fund, the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM), Mitchell Kapor Foundation, Sigrid Rausing Trust, New York Community Trust and others.

This report is available in the following languages: English

Health Status in the Impact Zone of the El Kafr El-Zayat chemical plant

Contents

Executive Summary

This report describes the final results of the work done at Kafr El Zayat on: "Health Status of Random Sample, Particularly Children, as the Impact of the Zone of El Kafr El-Zayat plant for pesticide and chemical production, formerly DDT producing".

The pesticides, especially those related to the organochlorine family, e.g. DDT are among the group known as persistent organic pollutants (POPs) which are organic compounds that resist photolytic, chemical and biological degradation. They are characterized by low water solubility and high lipid solubility, resulting in bioaccumulation in fatty tissues of living organisms. POPs are semi-volatile and, therefore, able to move long distances in the atmosphere, and are also transported in the environment in low concentrations by movement of fresh and marine waters, resulting in wide-spread distribution across the earth, including regions where they have never been used. Thus, both humans and environmental organisms are exposed to POPs around the world, in many cases for extended periods of time.

The current study included sampling of environmental media and individual clinical assessment. The sampling had been collected from the previously selected localities, at the studied area, for pesticides residue analysis. The samples were taken from water including surface water from the irrigation canal around the pesticide factory; animal tissue from fish (*Oreochromis niloticus)*; plant tissue from potato and onion; breast milk; animal milk; and human blood. Laboratory analysis of the environmental media revealed presence of residues of the major types of organochlorine pesticides.

The individual clinical assessment included seventeen (17) subjects; 12 males and 5 females, who were interviewed and clinically examined for possible long term, chronic effects of the POPs, principally the organochlorine pesticides. The subjects were met, interviewed and examined, according to a standardized format, at the outpatients' clinic of Kafr El-Zayat General Hospital. The interviewed subjects were selected through a stratified randomized sampling method, among the inflow of personnel to the outpatients' clinic of the hospital. The questionnaire included: personal data; present, past and family histories; current complaints; full clinical examination. The individual clinical assessment revealed many symptoms and signs denoting chronic or long term health effects due to exposure to environmental contamination, specially pesticides and particularly those belonging to the organochlorine group.

The study recommended different measures for cleaning up in both indoor and outdoor environments.

Introduction

Pollution is considered as one of the most serious problem that faces human societies in the whole world especially in the developing countries. Though produced by man himself and his activities, it has deleterious effects on human's environments and resources (*Khalaf et al.,* 1995). So, pollution and its effects are considered as one of man's greatest crimes against himself.

Pollution, in its broad sense, is the addition of either harmful or excess harmless substances to the environment, and a pollutant is defined as a substance that occurs in the environment at least in part as a result of man's activities, and which has a deleterious effect on living organisms (Moriarty, 1983).

The River Nile is recognized as the longest river, and is considered one of the most important rivers in the world. Within Egypt, it is the main resource of irrigation, industrial and domestic water (Kansoh, 1995). Due to human activities of various kinds along its course such as domestic, commercial, agricultural, industrial and navigation activities, different types of waste material enter the river, affecting its water quality.
Pesticide usage for agriculture in developing countries is constantly increasing, and was estimated to be 36 – 40 % of the world total in 1975 (*Alabaster, 1981*).

According to E.S.G. (1989), pesticides and the overuse of fertilizers have a negative ecological impact. In Egypt, over the last 30 years, the amount of pesticides used annually has declined from a high of about 30.000 metric tons in 1974 to 17.000 metric tons in 1982. However, a large variety of chemicals have been used on agricultural lands. These include DDT, Aldrin, Dieldrin, Benzene and others which are well known as environmental pollutants (*Sole et al., 1994*). This quantity was reduced to 500 metric tons in 2004 with the stoppage of the persistent organic pollutants (*Ministry of Agriculture Report, 2004*). All the Pesticides known as POPs were banned according to the ministerial decrees 874/1996 and 55/1996.

The use of pesticides for agricultural and health purpose is now so extensive that it has affected almost all forms of wildlife in some way. As a result of their usage they find their way into the freshwater sources and adversely affect the quality of water and create hazards for aquatic life where several of these pesticides are bioaccumulative and relatively stable, as well as toxic or carcinogenic, thus they require close monitoring (*Verma et al., 1978 ; Day, 1991 ; APHA, 1992*).

It has been estimated by Pimental & Goodman (1974) that only 5 % of the pesticides reach the target pests. Hence, about 95 % of the used pesticides end up in other parts of the environment. Most of pesticides ultimately find their way into rivers, lakes, ponds, and other water bodies (*Anees, 1975*) but also to the organisms which contribute to the food of fish (*Saker & Gaber, 1992*).

Reports issued by the Central Agriculture Pesticides Laboratory (CAPL) indicate that there were high concentrations of persistent organochlorine pesticides in samples collected from several drains and irrigation canals (*E.S.G., 1989*).

Some data on residues of many pesticides have been reported by *Edwards (1982*). Pesticides residues in water tend to vary markedly with seasons, the degree of turbulence as well as the amount of suspended particulate matter.

There is adequate legislative framework governing the environmental issues in Egypt. Annex (1) gives an insight on such a legislative framework.

Persistent Organic Pollutants (POPs)

Persistent organic pollutants (POPs) are organic compounds that resist photolytic, chemical and biological degradation. They are characterized by low water solubility and high lipid solubility, resulting in bioaccumulation in fatty tissues of living organisms. POPs are semi-volatile and, therefore, able to move long distances in the atmosphere, and are also transported in the environment in low concentrations by movement of fresh and marine waters, resulting in wide-spread distribution across the earth, including regions where they have never been used. Thus, both humans and environmental organisms are exposed to POPs around the world, in many cases for extended periods of time.

Persistent organic pollutants (POPs) include many pesticides, as well as dioxins, furans and PCBs. These chemicals pose particularly serious risks to human health. They persist in the environment, and may bioaccumulate and magnify in the food web. Because of the tendency of these chemicals to accumulate in fatty tissue, many (such as DDT and dioxin) are found in significant quantities in human breast milk. Many are mobilized during pregnancy when fat reserves are depleted, and subsequently find their way across the placenta to the newly developing fetus. There may be special windows of vulnerability in the development of fetuses when these chemicals can have long-term, irreversible effects on the reproductive and neurological systems.

Although many different forms of POPs may exist, POPs which are noted for their persistence and bioaccumulative characteristics include many of the first generation organochlorine insecticides such as dieldrin, DDT, toxaphene and chlordane and several industrial chemical products or byproducts including polychlorinated biphenyls (PCBs), dibenzo-p-dioxins (dioxins) and dibenzo-p-furans (furans).

Humans can be exposed to POPs through diet, occupational accidents and the environment including indoor). Exposure to POPs, either acute or chronic, can be associated with a wide range of adverse health effects, including illness and death.

Subjects, Material, and Methods

Subjects

Seventeen (17) subjects; 12 males and 5 females, were interviewed and clinically examined for possible long term, chronic effects of the POPs, principally the organo-chlorine pesticides. The subjects were met, interviewed and examined, according to a standardized format (annex 2), at the outpatients clinic of Kafr El-Zayat General Hospital. The interviewed subjects were selected through a stratified randomized sampling method, among the inflow of personnel to the outpatients' clinic of the hospital. The questionnaire included: personal data; present, past and family histories; current complaints; full clinical examination. 5 c.c. of blood was withdrawn from a group of them in order to be analyzed for residues of pesticides.

Material and Methods

Sampling Determination

The samples had been collected from the previously selected localities, at the studied area, for pesticides residue analysis. The samples were taken from the following media:

1. Water; surface water from the irrigation canal around the pesticide factory.
2. Animal tissue from fish (*Oreochromis niloticus)* which has a commercial name: "Bolti",
3. Plant tissue from onion, potato, parsley and bazingan.
4. Breast milk
5. Animal milk.
6. Human blood.

All the pesticides analysis had been carried out at the Central Laboratory of Mycotoxins, at the National Research Center, Dokki, Cairo.

The number of samples depended on the available budget and the requirement of the analytical Laboratory.

The quantitative determinations based on comparing of the samples with those obtained with the reference standard solutions.

Determination of Pesticide Residues in the Biological Samples

It was decided to acquire the National Research Centre Laboratory of Mycotoxins in Dokki for a POPs materials analysis and the methods of sampling collection. The samples proposed are as follows:

Type of sample	Number of samples
Water (tap)	3
Water (Surface)	3
Blood	3
Human milk	2
Plant tissues: Onion, Potatoes, Parsely and Bazingan	4
Fish tissue	2
Animal milk	3
Total number	20

Determination of pesticide residues has been carried out according to the method of Pesticides Analytical Manual (1978) and that of the Analytical Method of the AOAC (1980b).

The condition of separation would base on Hewlett Packard's Gas-Chromatography (model 5890 with HP 3392 A integrator).

Annex (3) illustrates the details of sampling and analyses of the various types of biological material being collected.

The Results

Environmental Health Aspects

1. Individual Health Assessment

The following tables (1 – 6) illustrate the results of health examination carried out on a number of individual residents of Kafr El-Zayat, who were seeking medical advices in the Public Hospital located at the City of Kafr El-Zayat.

Table (7) Personal History Parameters of the Interviewed Residents

Parameters	Frequency No.	Percent (%)
Sex: male	12	70.59
female	5	29.41
Age: <25 years,	4	23.53
25 – 35,	4	23.53
35 – 45,	4	23.53
45 – 55,	3	17.65
55 years+	2	11.76
Marital Status: Married	10	58.82
Single	6	35.29
Other/s	1	5.88
Occupation: Farmer	8	47.06
Employee	2	11.76
Worker	4	23.53
housewife	3	17.65
Habits: Tea and coffee	14	82.35
Smoking	8	47.06
Drugs/ Medicines	6	35.29
Exposure and Use of Pesticides		
Usually	9	52.94
Occasionally	6	35.29
Rarely	2	11.76
Use of Personal Protection; Yes	2	11.76
No	15	88.24

Table (2) Present History Parameters of the Interviewed Residents

Parameters	Frequency No.	Percent (%)
General Manifestations		
Gastrointestinal Malignancies: Fever, loss of appetite, loss of weight, easy fatigability	1	5.88
Body Swellings: Axillary, inguinal	1	5.88
Feminization: Gynaecomastia, loss of body hairs in males	2	16.67
Recurrent infections	5	29.41
Abdominal Manifestations		
Told to have liver or renal disease	6	35.29
Jaundice (Sclera, dark urine, clay stools)	2	16.67
Abdominal pain (Right, Left hypochondrial or loin pain)	4	23.53
Abdominal distension	8	47.06
Lower Limb Swelling	4	23.53
Bleeding from orifices (hematemesis, melena, gum, nose)	3	17.65
Urine abnormalities in volume, colour, or micturition	4	23.53
Neurological changes:		
Psychiatric abnormalities	2	16.67
Learning difficulties	4	23.53

Table (3) Parameters of Past History and Complaints Elicited by the Interviewed Residents

Parameters	Frequency No.	Percent (%)
Past History		
Intoxication in the last 10 years	2	16.67
History of Bilharziasis;		
- contact with water canals,	8	47.06
- Bilharzial treatment	6	35.29
- Hypertension	4	23.53
Infective hepatitis	4	23.53
Asthma	4	23.53
Operations/ injuries	5	29.41
Vaccinations	5	29.41
Reproductive problems	5	29.41
Drug intake	6	35.29
Complaints		
Headache	6	35.29
Pains	4	23.53
GIT	8	47.06
Liver	6	35.29
Cardiovascular	2	16.67
Respiratory	2	16.67
Renal	3	17.65
Neurological	5	29.41
Musculoskeletal	7	41.18

Table (4) Family History Parameters of the Interviewed Residents

Parameters	Frequency No.	Percent (%)
Birth Defects	1	5.88
Mental Retardation	1	5.88
Liver Disease	8	47.06
Kidney Disease	5	29.41
Cancer	3	17.65
Psychiatric Disturbances	5	29.41

Table (5) General Examination Parameters at the Interviewed Residents

Parameters	Frequency No.	Percent (%)
Vital Signs		
Temperature: normal		
abnormal		
Blood pressure: normal		
Hyper-		
Hypo-		
Respiratory rate: normal		
Tachpnoea		
Bradypnoea		
Head and Neck		
Jaundice		
Pallor	2	16.67
Puffy Eyelids	2	16.67
Foetor Hepaticus	3	17.65
Swellings	2	16.67
Lymph nodes	2	16.67
Neck veins congested	3	17.65
Other/s	2	16.67
Upper and Lower Limbs		
Spider nevi	2	16.67
Palmar erythema	3	17.65
Flapping tremors	1	5.88
Lymph nodes	3	17.65
Lower Limb Oedema	5	29.41

Table (6) Abdominal Examination Parameters at the Interviewed Residents

Parameters	Frequency No.	Percent (%)
Liver abnormality	8	47.06
Hepatomegaly	4	23.53
Liver Cirrhosis	2	16.67
Liver (Bilharzial)	4	23.53
Abnormal spleen	2	16.67
Abnormal gall bladder	1	5.88
Abnormal kidney	2	16.67
Tender Colon	4	23.53
All abnormal abdominal parameters	10	58.82

2. Assessment of Pesticide Residues in Biological Samples:

The residues of pesticide concentration (ng/g) during the period of this project are given in Tables (7) and graphically represented in Fig. (1 – 5) which illustrates the results of

assessment of chlorinated hydrocarbon pesticide residues in a number of biological samples as follows (ng/g). Note the following regulatory limits in Egypt for various pesticides in drinking water, vegetables, and milk:
Lindane: 2 mg/L
Dieldrin: 0.03 mg/L
DDT/DDE: 2 mg/L

It was found that residues of Lindane were present in the surface water (0.057) onion (151.418) and fish (231.007 and 59.105) samples. Residues in onion and fish exceeded regulatory limits by 75 – 115-fold.

Residues of heptachlor not detected in all samples where the residues of heptachlor epoxide were detected at the samples of tap water (0.861), onion (170.155), and parsley (239.243). The heptachlor levels in tap water are nearly 29,000 times higher than permitted in the EU (0.03 ug/l)

Dieldrin residues were presented in the samples of tap water (0.33 & 0.338), onion (7.523), and animal milk (22.802) where endrin residues were presented in the samples of onion (13.203) and animal milk (0.642). Dieldrin levels were more than 10 times higher than regulatory standards in tap water; 250 times higher in onion; and more than 20 times higher than regulatory levels in animal milk.

Residues of P.P-DDE were detected in the all samples of tap water and ranged from 3.03 to 3.366, surface water (3.819 to 8.12), blood samples (246.55 to 426.78) and plant tissue samples including onion (157.699), potato (21.199), parsely (56.312), and bazingan (57.889). Levels in tap water and surface water were 1.5 – 4 times than regulatory limits. Levels in blood were 120 – 214 times higher than regulatory limits for drinking water. In vegetables DDE levels were 11 – 79 times higher than regulatory limits.

It was found that residues of O.P-DDD were presented at the samples of surface water (0.091 and 0.136), blood (7.627 and 15.258), potato (32.529), and animal milk (3.536). The P.P-DDD metabolite was present in the samples of tap water (2.054 and 2.719), surface water (12.623), blood (234.528), potato (27.517), bazingan (455.682) and animal milk (4.116). While no regulatory limits specifically address DDD, the levels found in these samples grossly exceed limits for DDE.

Residues of P.P-DDE were detected in the all samples of O.P-DDT which was detected in the plant tissue; onion (2.718), potato (8.015), bazingan (6.398), and animal milk (4.495 and 0.319).

P.P-DDT were present in the samples of surface water (0.513), onion (7.946), potato (1.033), parsley (8.655), human milk (1.69 and 25.639), and animal milk (122.766). DDT levels in animal milk were more than 60 times higher than regulatory limits. In human milk the levels were up to 12 times higher than regulatory limits for animal milk.

Chlorpyrifos – MS residues were presented in the samples of tap water (0.144),, surface water (0.081 to 0.501), and parsley (51.322).

Malathion residues were presented in the samples of tap water (1.415), surface water (4.71 to 18.087), blood (93.556), and fish (454.718).

Profenofos residues were present in samples of tap water (0.515 to 0.663), blood (58.998), onion (32.689), and animal milk (3.467) .

Environmental contamination by pesticides, due to their toxicity and persistence in the environment, has long been recognized to be a continuing problem. They are found in considerable quantities in water and sediment of lakes, rivers and seas (Marble & Delfino, 1988).

The concentration of pesticides found in the collected samples showed the pollution which affects the biota and forms a public health problem. Due to their low solubility in water, slow degradability coupled with their strongly lipophilic character, most pesticides possess partition coefficients which strongly favour accumulation in biolipids (Hassal, 1990). Because of pesticide toxicity, they are suspected of exerting detrimental effects on metabolism and reproduction of highly contaminated individuals.

The use of pesticides for agriculture and health purposes is now so extensive that it has affected almost all forms of wildlife in some way. As a result of their usage they found their way into the freshwater sources and adversely affect the quality of water and create hazards for aquatic life where several of these pesticides are bioaccumulative and relatively stable as well as toxic or carcinogenic thus they require close monitoring, reduction, and elimination where possible.

Table (7): Results of assessment of Chlorinated Hydrocarbon pesticide residues in a number of biological samples

Chlorpyrifos - Ms	p.p - DDT	o.p - DDT	p.p - DDD	o.p - DDD	p.p- DDE	Endrin	Dieldrin	Hep.epoxid	Heptachlor	Lindane
Nd	Nd	Nd	2.719	Nd	3.03	Nd	Nd	Nd	Nd	Nd
Nd	Nd	Nd	Nd	Nd	3.351	Nd	0.33	0.861	Nd	Nd
0.144	Nd	Nd	2.054	Nd	3.366	Nd	0.338	Nd	Nd	Nd
0.411	Nd	Nd	Nd	Nd	3.819	Nd	Nd	Nd	Nd	Nd
0.081	Nd	Nd	Nd	0.091	8.12	Nd	Nd	Nd	Nd	0.057
0.501	0.513	Nd	12.623	0.136	4.85	Nd	Nd	Nd	Nd	Nd
Nd	Nd	Nd	Nd	7.627	268	Nd	Nd	Nd	Nd	Nd
Nd	Nd	Nd	Nd	Nd	246.55	Nd	Nd	Nd	Nd	Nd
Nd	Nd	Nd	234.528	15.258	426.78	Nd	Nd	Nd	Nd	Nd
Nd	7.946	2.718	Nd	Nd	157.699	13.203	7.523	170.155	Nd	151.418
Nd	1.033	8.015	27.517	32.529	21.199	Nd	Nd	Nd	Nd	Nd
51.322	8.655	Nd	Nd	Nd	56.312	Nd	Nd	239.243	Nd	Nd
Nd	Nd	6.398	455.682	Nd	57.889	Nd	Nd	Nd	Nd	Nd
Nd	Nd	Nd	Nd	Nd	Nd	Nd	Nd	Nd	Nd	231.007
Nd	Nd	Nd	Nd	Nd	Nd	Nd	Nd	Nd	Nd	59.105
Nd	1.69	Nd	Nd	Nd	Nd	Nd	Nd	Nd	Nd	Nd
Nd	25.639	Nd	Nd	Nd	Nd	Nd	Nd	Nd	Nd	Nd
Nd	122.766	4.495	Nd	Nd	Nd	Nd	22.802	Nd	Nd	Nd
Nd	Nd	0.319	Nd	3.536	Nd	0.642	Nd	Nd	Nd	Nd
Nd	Nd	Nd	4.116	Nd	Nd	Nd	Nd	Nd	Nd	Nd
(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)	(ng/g)

Fig. (1) :

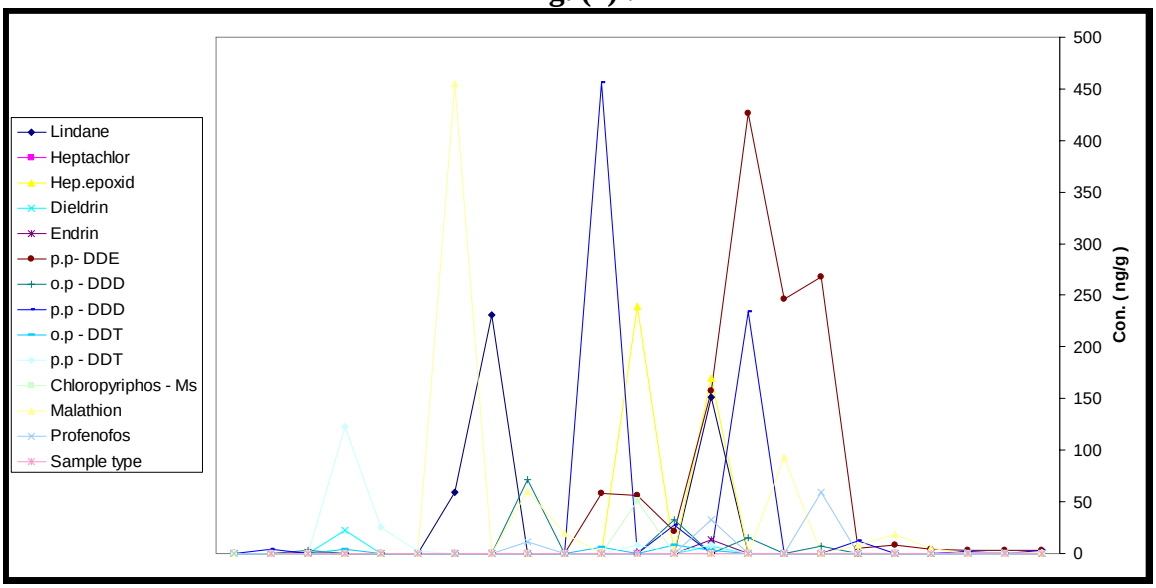

Lindane
Heptachlor
Hep.epoxid
Dieldrin
Endrin
p.p- DDE
o.p - DDD
p.p - DDD
o.p - DDT
p.p - DDT
Chloropyriphos - Ms
Malathion
Profenofos
Sample type
500
450
400
350
300
250
200
150
100
50
0
Con. (ng/g)

Fig. (2)

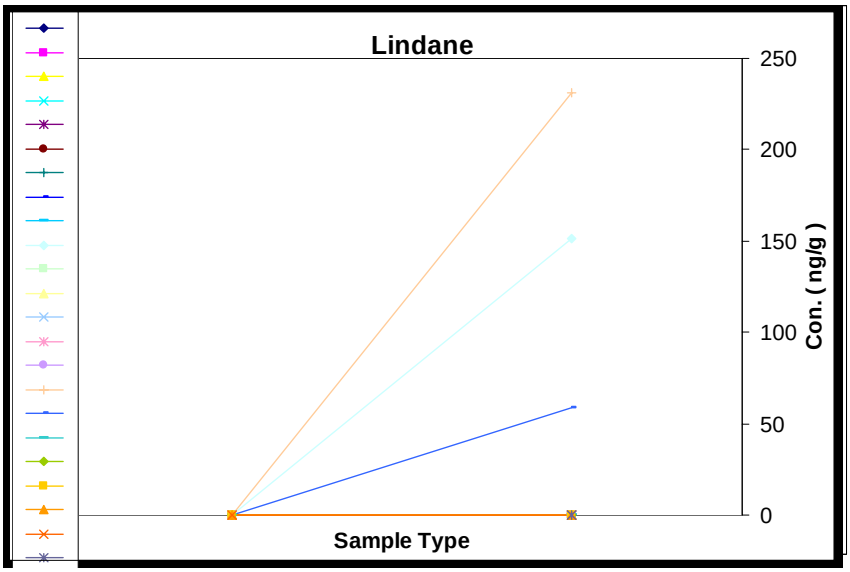

Lindane
250
200
150
100
50
0
Con. (ng/g)
Sample Type

Fig. (3)

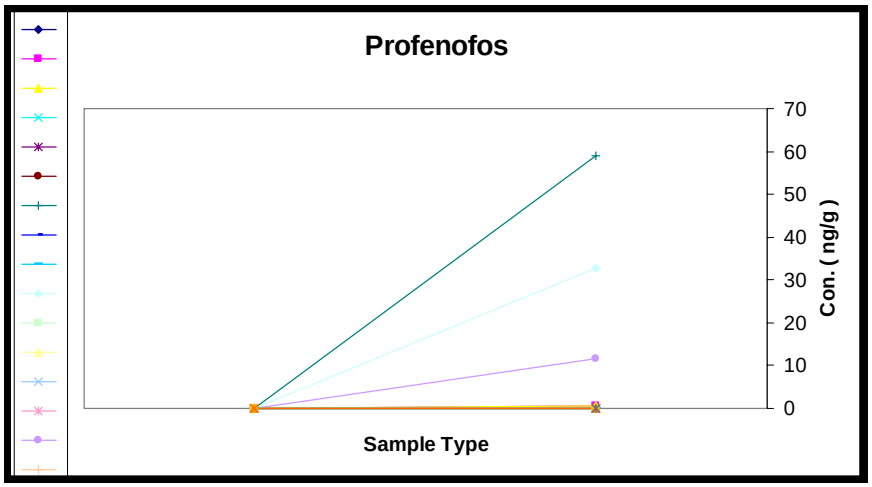

Profenofos
70
60
50
40
30
20
10
0
Con. (ng/g)
Sample Type

Fig. (4)

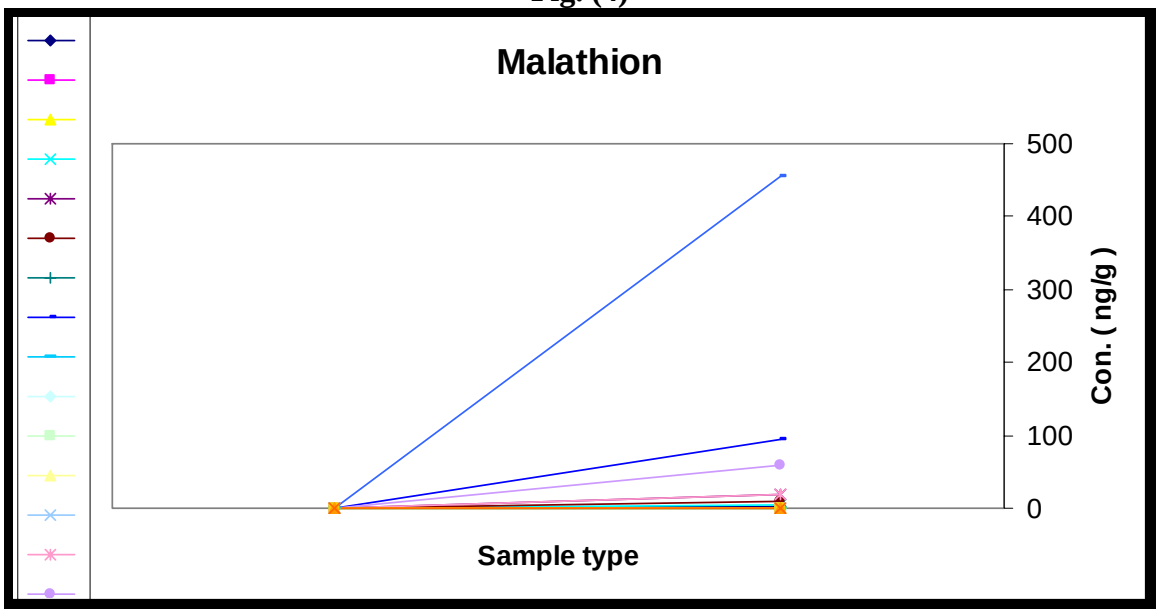
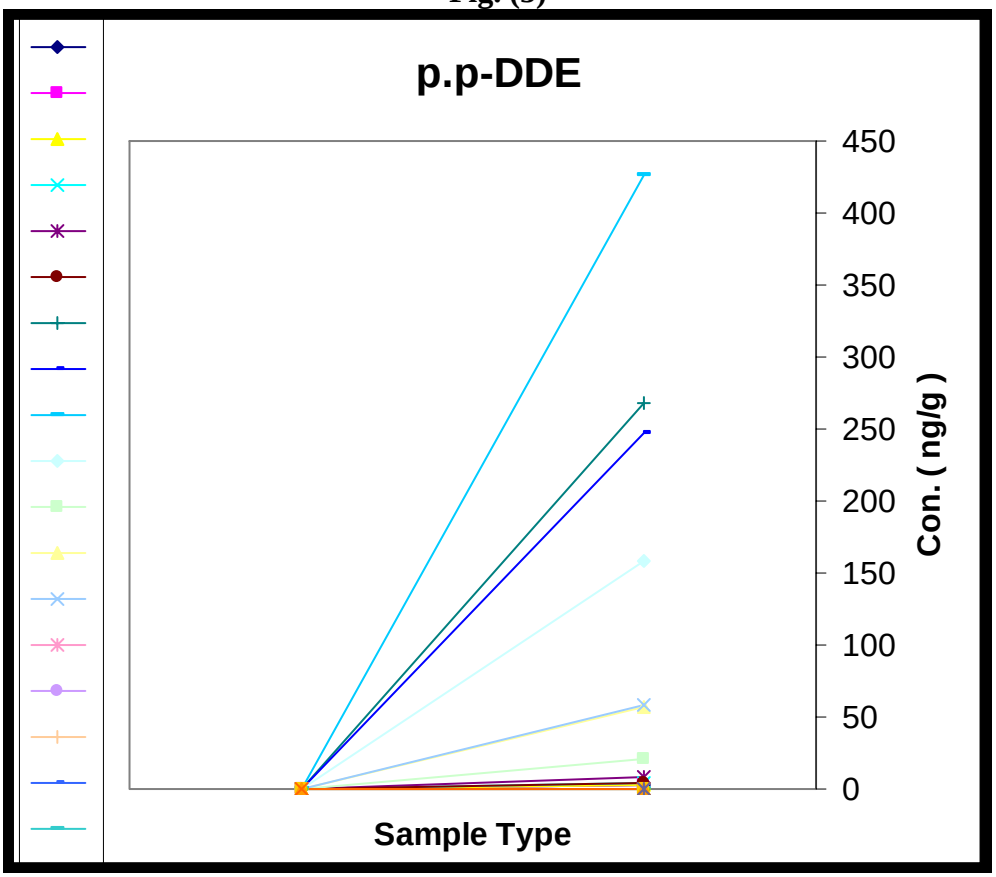

Malathion
500
400
300
200
100
0
Con. (ng/g)
Sample type

Fig. (5)



Recommendations and Conclusions

1. Concerning the Indoor Environment

It was decided to give recommendations for each unit being visited and checked up. But due to similar conditions existing in the majority of the factory units, however, special mentioning to problems in certain sections in the factory could be separately evaluated. In addition, there is no physical separation among the different departments in the factory. Factory workers are not assigned to certain units for a long duration. They are transferred (shifted) from one unit to another according to the work needs and products required.

Some units have been visited during full-capacity operations while others were either closed or pass in some sort of maintenance.

a- Medical Records:
- Medical files must be complete, properly arranged (preferably computerized)
- Investigations must be recorded (specially the results of A.Ch. monitoring) with the baseline (pre-employment levels).
- Health care personnel must be trained on "record management and retrieval".

2- Concerning health and safety regulations and procedures:

- training of the factory workers for proper application of protective measures in a correct way.

a- Hazardous zones:

- Hazardous areas (zones) should be well-demarcated, using international warning signs (labels) with written instructions (in Arabic) and suitable drawings, illustrating different accidents that may happen (develop) in risky areas.

b- Handling, transport and storage rules:

- Storage of materials should be limited to barrels and containers with proper nameplates and warning signs.
- Transport vehicles should be regularly inspected and maintained, and decontaminated continuously.

- The sampling analysis results indicated that the residue of most pesticides ultimately find their way into the water (surface and tap), vegetables, blood and breast milk. Samples which have been found to be highly toxic not only to fishes

but also to the organisms which contribute to the food cycle and finally to humans.

- Seasonal (temporary) female juvenile workers should follow the safety instructions, as other regular (permanent) workers should pass through, concerning handling of chemicals. They should be regularly examined and investigated. However, their number should be minimized whenever possible.

- Samples should be collected from soil, sediment and other media for analysis of pesticides residues.

- An awareness program should be directed to the farmers to use environmentally safer alternatives to dangerous pesticides.

References

Alabaster, J. S. 1981 : Review of the state of aquatic pollution of East African inland waters. CIFA Occas. Pap. 9 : 35.

L. Ritter, K.R. Solomon, J. Forget, M. Stemeroff and C.O'Leary (2005). PERSISTENT ORGANIC POLLUTANTS: An Assessment Report on: DDT-Aldrin-Dieldrin-Endrin-Chlordane, Heptachlor-Hexachlorobenzene, Mirex- Toxaphene, Polychlorinated Biphenyls, Dioxins and Furans. Prepared by: Canadian Network of Toxicology Centres and Deloitte and Touche Consulting Group

AOAC – Assoc. Off. Anal. Chem. 1980 b : Official Methods of the Association Official Analytical Chemists. Washington D. C. 13th ed., Chapter 29 : 466 – 496, " Pesticides Residues ".

Anees, M. R. 1975 : Environmental toxicology of pesticides. Pakistan J. Zool., 7 : 135.

APHA (American Public Health Association) 1992 : Standard Methods for the examination of water and wastewater. 18th ed., Greenberg, A.E., Clesceri, L.S. & Eaton, A. D.. (editors). APHA, WEF & AWWA, Washington D.C.

Day, E. K. 1991 : Pesticide Transformation Products in surface waters. Pages 217 – 241, Chapter 16. In : somasundaram, L. & Coats, J.R.(eds.). Pesticide Transformation Products – Fats and Significance in the environment. American Chemical Society Symposium Series 459, Washington DC, 305pp.

Edwards, C. A. 1982 : Nature and origins of pollution of aquatic system by pesticides. In Khan, M.A. (Editor) : pesticides in aquatic environment. Plenum Press, New York and London.

E.S.G.(1989) : Environmental and health impact of irrigation and drainage system in Egypt, advisory panel for land drainage in Egypt, Drainage Research Institute. 1989.

Hassal, K.A (1990) : The biochemistry and uses of pesticides : Structure, Metabolism, Mod of Action and Uses in Crop protection. MacMaillan Education , London. 2nd Ed., 536 pp.

Khalaf, E. A. ; Gala, M. ; Authman, M. 1994 : A study of the seasonal variation of pesticides contamination in a Nile Drainage Canal water, and their subsequent occurrence in some ***Oreochromis niloticus*** organs. Pages 89 – 120 National Institute of Oceanography & Fisheries, Alexandria, Egypt.

Kansoh, R.M. 1995 : River Nile water quality (Rosetta branch) Pages 319 – 325 National Institute of Oceanography & Fisheries, Alexandria, Egypt.

Marble, L.K. & Delfino, J.J. (1988) : Extraction and solid phase cleanup methods for pesticides in sediment and fish. American laboratory, 20 (11) : 23 – 32 .

Pesticides Analytical Manual 1978 : Methods which detected multiple residues. Vol. 1, U. S. Department of Health and Human Services, Food and Drug Administration.

Pimental, D. & Goodman, N. 1974 : Environmental impact of pesticides. In : Survival in toxic environments. Ed. Kham, M.A.Q. Bederka, J.Pjn. Academic Press, London, P. 25 – 52 .

Saker & Gaber, 1992 : Ultrastructural changes induced by Diazinone and Neopybuthrin in skeletal muscles of ***Tilapia nilotica***. Bull. Environ. Contam. Toxicol., 48 : 467 – 473 .

Sole M. ; Porte, C. ; Pastor, D. ; Albaiges, J. 1994 : Long-term trends of polychlorinated biphenyls and organochlorinated pesticides in mussels from the Western Mediterranean Cost. Chemosphere, 28 (5) : 897 – 903.

Verma, S. R. ; Bansal, S. K. ; Dalela, R. C. 1978 : Toxicity of selected organic pesticides to a freshwater teleost fish, Saccobranchus fossilis and its application in controlling water pollution. Arch. Environ. Contam. Toxocol., 7 : 317 – 323 .

Annexes

Annex (1): Gharbiya Governorate information:

Gharbiya Governorate is located just in the middle of Delta and exhibited an area of 1942.34 Km^2, of which 100% is inhabited. Gharbia is bordered in the north by Kafr Al-Sheikh Governorate and in the south by Menofiya Governorate and in the east the Demietta Branch of the River Nile and in the west by the Rosetta (Rasheed) Branch of the River Nile. Tanta is the main city (Capital) of the Governorate and is located 90 km far from Cairo and 120 Km from Alexandria City. The Governorate consists of 8 Districts (and 8 cities): Basion, Kotor, El-Mahala El Koubra, Samanoud, Kafr El-Zayat, Tanta, El-Santa and Zefta (Fig. 1). The 8 districts comprise 53 rural units with 317 villages and hamlets.

Gharbia is a main agricultural region, at which 393.5 thousand Feddan (1 feddan = 4200 acres) is usually cultivated with cash crops, cotton, vegetables, potatoes, flax, etc.
The Governorate is considered an important industrial centre because it possesses major spinning and weaving facilities, especially in Mahala, in addition to major enterprises working in oil and soap, soda and salt, fertilizers, pesticides, etc.

Fig. (1): Map of Gharbia Governorate at the Middle of Delta

According to the CAPMAS (2004), the total labour force constitutes 35% of the total population at the Governorate and 1,350 thousand (927 thousand in the rural part and 423 thousand in the urban part); of which 1,220 thousand are currently working (868 thousand in the rural part and 352 thousand in the urban part) and 130 thousand are currently unemployed (59 thousand in the rural part and 71 thousand in the urban part).

Environmental status of Gharbia Governorate

First: in the field of solid waste:

During the last two years, the Gharbia governorate has given much attention to cleanliness and beautification activities through supporting the cleanliness body in the governorate. These efforts resulted in the following:

A limited bid is being executed for choosing the best company which is going to execute integrated management of waste by new technical methods.

Gharbia Governorate announced an invitation for qualifying the local and international companies in the field of public cleanness in the eight cities of the governorate and 12 local and international companies submitted to this invitation six of them have been qualified by a high technical committee and a limited bid is being executed for choosing the company which is going to execute the integrated project for management of waste by new technical methods.

A sanitary landfill has been established in Tanta city. It has a capacity for the municipal solid waste generated from Tanta city for two years.

5 feddans have been allocated at Dafra village in Tanta District for establishing a factory for using solid waste in manufacturing organic fertilizer/ soil conditioner.

Another factory is being established on an area of 4 feddan at Al- Dawakhla village in Mehalla Al-Kobra city using solid waste in manufacturing organic fertilizer/ soil conditioner.

A local bid is being held for collecting and collecting, transferring, and disposing municipal solid waste from houses in Tanta city and Mehalla al-Kobra city.

A study has been prepared about the environmental effect of transferring about 200,000 tons of accumulated solid waste from the old dump-site of Tanta City for filling up one of the unused drains in Kafr Al-Zayat City

The cleanliness agency has been supplied with a large number of vehicles equipped for transferring municipal solid waste in addition to mending all old vehicles.

The entrance of Tanta City has been planted with evergreen trees. This is considered the first stage of an integrated plan for developing cleanliness and beautifying Tanta City with its entrances.

Second: in the field of hazardous waste :

Supported by the Social Fund for Development (SFD), the health and population department is establishing and running a group of incinerating facilities for treatment of the hazardous health care waste generated in the health care facilities establishments. Four of these incinerating facilities at: Zefta public hospital, Kafr Al-Zayat public hospital, Mehallet Monof hospital, and Mehalla Al-Kobra chest hospital .

Third : in the field of protecting air from pollution :

All brick factories in the governorate have been developed by using developed systems of firing and the factories are periodically examined by measuring the rate of exhaust pollutants.

Ninety presses have been delivered to the Governorate in order to be used for pressing rice straw in fields and the farmers have been forbidden to get rid of the waste straw through open burning.

Fourth: in the field of protecting the River Nile from pollution :

The governorate has followed up the industrial firms for putting an end to the pollution resulted from draining the waste of these firms in the River Nile waste and these firms have already established units for treating the drain resulted from them .

Fifth: in the field of improvement of the environment:

A time programmer has been prepared for spreading green areas, forestation and establishing nurseries on the two sides of canals, drains and streams.

Sixth: in the field of the agricultural activity and protecting sail from pollution:

Coordinating with agriculture ministry bodies, the governorate spreads awareness among farmers for rationalizing the use of chemical fertilizers and disinfectants.

Kafer Al-Zayat District Structure:

The total area of Kafr Al-Zayat District about 203.44 Km2, represents about 10.47% of the total Governorate area.

The district is separated from Behira Governorate by the Rosetta (Rashid) Branch of River Nile at the West, bordered by Menufia Governorate from the South and by the Tanta City from the East, and by Basioun District from the North.

The District consists of:
- One City (Kafr Al-Zayat),
- Six administrative rural units, which are:
    - Kfoor Benchay,
    - Ebyar,
    - El-dalgmoon,
    - Dibshan,
    - Aboelghr, and
    - Meshla.
- 37 large villages and 115 hamlets (small villages, Nagaa, Kafr, etc.).

The following map (Fig. 2) illustrates the main administrative rural units of Kafr El-Zayat District.

Fig. (2): Kafr Al-Zayat District Map Showing the Main Administrative Rural Units and the sampling sites collection

Project location:

Egypt, El Gharbia governorate, Kafer El Zaiat City, Kafer El Zaiat plant (KZ) for pesticide and chemical production, which produces 33 kinds of pesticides and chemicals such as Dimethoate, Malathion, Mancozeeb, Chlorpyrifos Ethyl, Chlorpyrifos Methyl, Diazinon. Up until three years ago, the plant also produced DDT. All information about the Kafer El Zaiat City, Kafer El Zaiat plant (KZ) would included in the reports, this factory is located in the middle of industrial factories area in Kafer El Zayat. The residential area of Kafer El Zayat lies under the common wind direction of the industrial factories area.

Industrial facilities of El - Gharbiya Governorate

Kafr El-Zayat is considered an important industrial spot among the traditional industrial zones in Egypt. Since the beginning of the 20th Century, it possesses essential industrial activities, e.g. cotton ginning, weaving and spinning; oil and soap industries; soda and salt manufacturing, etc.

Following the era of the World War II (1939 – 1945), many other industrial activities have been developed, extended and flourished, and the District was since recognized as an important growing industrial area, attracting tens of thousands of workers from within as well as from outside the District.

The following tables (1 – 4) illustrate various aspects showing the production indicators in a variety of industrial facilities present at Kafr El-Zayat District.

Table (1): The Cotton Ginning Companies and Their Productivity in Gharbia Governorate

Companies	Place	Flower cotton Metric Tons	Products	
			Seeds	Commercial Seeds
Arab company	Zefta	113219	-	78177
Delta company	Al-mehall al-kobra1	44198	-	33995
	Al-mehall al-kobra2	52983	-	41114
	Kafr Al-zayat1	91935	-	72087
	Kafr Al-zayat2	-	-	-
Al-Wadi company	Kafr Al-zayat	114856	-	90229
Nile company	Al-mehall al-kobra1	98282	-	75558

Companies	Place	Flower cotton	Products	
		Metric Tons	Seeds	Commercial Seeds
	Al-mehall al-kobra2	80768	-	59493
	Kafr Al-zayat	88342	-	65242
	Zefta	23207	15072	3305
Egypt Company	Al-mehall al-kobra1	90982	29320	40310
Total		798772	44392	559510

Table (2): The production of oil, flax and fodder in Gharbia Governorate:

Company	Tanta Company for oil and soap	Salt & Soda company
Place	Tanta	Kafr Al-Zayat
Capital (by thousand pounds)	130000	150000
wages (by thousand pounds)	19287	11133
production (by thousand pounds)	207522	87212
number of workers	3160	1812
Products	Quantity	
washing soap (by ton)	7162	13755
toilet soap (by ton)	6259	3516
cooking butter (by ton)	13209	
cooking oil no1(by ton)	27709	
animal fodder(by ton)	83320	
paint oil (by ton)	1060	
flax oil coke (by ton)	1119	
pure glycerin (by ton)	459	
cotton oil cake (by ton)	37358	
oil cake (by ton)		28553
liquid silicate(by ton)		7378
stone silicate(by ton)		1376
sphinx oil no1(by ton)		10852
sphinx fodder(by ton)		16675
artificial glycerin(by ton)		654

Table (3): The production of paper in Gharbia Governorate:

Company	**The paper company (Verta) The carton factory in Kafr Al-Zayat**
Place	Kafr Al-Zayat (Al-Dalagmoon)
Capital (by thousand pounds)	20000
Wages (by thousand pounds)	4950
Production value (by thousand pounds)	32738
Number of workers	583
Production	
Boxes- bars - ribbed carton sheets	16474

Table (4): The Production of fertilizers in Gharbia Governorate

Company	**The financial & Industrial company**
Place	Kafr Al-Zayat
Capital (by thousand pounds)	35045
Wages (by thousand pounds	37666
Production value (by thousand pounds)	173500
Number of workers	2853
Production	
Sulfuric acid 98% (by ton)	600021
Super phosphate fertilizer (by ton)	1434017
Distilled water (by ton)	263
Special pure sulfuric acid (by ton)	18
Dilute sulfuric acid 30%(by ton)	33
Sulfuric acid 80%(by ton)	14
Sulfuric acid 34%(by ton)	102
Lab sulfuric acid (by ton)	43
Iron sulfate (by ton)	216

At the 1950s', an old plant manufacturing household and agricultural chemicals started to grow and develop rapidly, and soon became one of the leading facilities manufacturing household and agricultural pesticides and chemicals at Egypt and the Middle East.

The "***Cotton Dust***" which is the DDT, produced by the "Kafr El-Zayat Company for Pesticides and Chemicals", protected the main crop produced by the country for years and years. Meanwhile, with the existence and wide-spread extension of the Concept of

the "Environmentally- Sustainable Development", it was discovered that the family of organochlorines or the chlorinated hydrocarbons, which DDT is an important famous member, polluted the lands, waters, and hence the food chain.

Currently, the facility is employing about 685 employees; the vast majority of them are male adults (660) with a minority of females (25) working at the administrative department.

Annex (2): The Standardized Format for Individual Clinical Assessment.

(A) History

- **Personal History**

Name: **Sex:** **Age:**
Marital Status: **Residence:**
Occupation :
Habits:

Exposure and Use of Pesticides:

- **Present History**

1. **General Manifestations:**

Gastrointestinal Malignancies;
Fever, loss of appetite, loss of weight, easy fatigability
Body Swellings;
Axillary, inguinal
Feminization;
Gynaecomastia, loss of body hairs in males,
Recurrent infections;

2. **Abdominal Manifestations:**

Told to have liver or renal disease
Jaundice (Sclera, dark urine, clay stools)
Abdominal pain (Right, Left hypochondrial or loin pain)
Abdominal distension
Lower Limb Swelling
Bleeding from orifices (hematemesis, melena, gum, nose)
Urine volume, colour, and micturition abnormalities)

3. **Neurological changes:**

- **Psychiatric abnormalities;**

- **Learning difficulties;**

- **Past History**

History of Intoxication in the last 10 years
History of Bilharziasis;
- **contact with water canals,**
- **history of Bilharzial treatment**

History of Diabetes Mellitus
History of Hypertension

- **Family History**

Birth Defects
Mental Retardation
Liver Disease
Kidney Disease
Cancer
Psychiatric Disturbances

(B) Clinical Examination

- **General Examination**

- **Vital Signs:**

- **Head and Neck**

Jaundice
Pallor
Puffy Eyelids
Foetor Hepaticus
Lymph nodes

- **Upper and Lower Limbs**

Spider nevi
Palmar erythema
Flapping tremors
Lymph nodes
Lower Limb Oedema

- **Abdominal Examination**

Inspection

Palpation

Percussion