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Repi Open Dump Site Environmental Health Problem on Workers and People around It

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Abstract**—** *In most developing countries, infectious wastes are still mixed with general solid waste for collection. Waste pickers, many of whom are children, at the dumpsites commonly segregate and recycle the disposable syringes and cotton bandages, despite the obvious contamination from the blood and other body fluids visible on these wastes. The participation of private sectors and poor monitoring systems wastes from industries, hospitals (health institutions) and different organizations are being mixed with municipal solid wastes and dumped together into this site. Presumably, this condition would make the site to be potential source of exposure to different health affecting situations for solid waste disposal workers. The health problems of solid waste disposal workers were associated with the nature of the work they do. The respondents said that physical injury (51.4%), skin problems (57.14%), respiratory problems (74.29%), GIT problems (60%), headache, nausea and vomiting (100%) and vision problems (62.57%) are their main health problems and they are experiencing them after they became solid waste disposal workers. the presence of the constitutional rights of the citizens to live on clean environment and many proclamations and international conventions to avoid health risks for workers, nothing had done for solid waste disposal workers. Adequate protective wears (personal protective equipment, PPE), such as respiratory masks, hand gloves, protective clothing and safety shoes should be provided to solid waste disposal workers, to ensure their safety and that of the public in general. Regular health education on health and safety issues for solid waste disposal workers is very important to develop Behavioral Based Practice (BBP).*

I. INTRODUCTION

Disposal of wastes to land is an inevitable component of every solid waste management system. No waste can be removed from its point of generation without there being a place for it to be taken. Even if facilities are provided for processing the waste, to recover materials or energy for instance, there will always be a need for land to dispose a residual proportion of the waste originally produced.

Solid wastes must be managed in a sanitary and environmentally conscious manner. In most developing countries the main option for managing municipal solid waste is disposal at open dumping site. Some studies suggest that certain substances emitted from disposal sites lead to birth defects, respiratory problems, and increased risk of cancer (Carotti AA, Smith RA, 1974, Dubay JP, Gamble HR, et.al. 1992).All activities in solid waste management involve risk, either to the worker directly involved, or to the nearby resident. Risks occur at every step in the process, from the point where residents handle wastes in the home for collection or recycling, to the point of ultimate disposal.

Health risks from waste are caused by many factors, including:

- The nature of raw waste, its composition (e.g., toxic, allergenic and infectious substances), and its components (e.g., gases, dusts, leachates, sharps);
- The nature of waste as it decomposes (e.g., gases, dusts, leachates, particle sizes) and their change in ability to cause a toxic, allergenic or infectious health response;
- The handling of waste (e.g., working in traffic, shoveling, lifting, equipment vibrations, accidents);
- The processing of wastes (e.g., odor, noise, vibration, accidents, air and water emissions, residuals, explosions, fires);
- The disposal of wastes (e.g., odor, noise, vibration, stability of waste piles, air and water emissions, explosions, fires).

It is a delusion to believe that the health and social problem posed by wastes come only from waste storage or collection activities. Unfortunately, open dumping is currently the world's most common disposal method. No amount of careful waste collection or treatment will reduce the hazards to health or the environment from disposal if the final resting place for waste is uncontrolled dump. During long dry periods the surface of landfills and open dumping grounds becomes dry and very dusty. The waste disposal workers are exposed to air borne dust which makes their working conditions all the more unpleasant. Under these conditions infections and allergic disorders, especially of the respiratory tract, are common.

Tuberculosis, scabies, multi-system allergic disorders, asthma, respiratory infections, ophthalmic diseases, ulcers and stomach problems are other commonly reported diseases. The problem is acute because waste disposal workers are not protected by occupational health and safety measures. None were found to use any kind of protective gear like gum boots, plastic aprons, masks or gloves.

Despite the lower level of commercial, industrial, and institutional activity in developing countries, their solid waste is not necessarily devoid of hazardous wastes, because the regulatory framework and enforcement system to segregate and separately collect such wastes are nearly non-existent or dysfunctional. Bloodied bandages, cotton swabs, and syringes from hospitals are commonly found within the mixed municipal solid waste collected in developing countries. Such wastes are often placed in piles within large bins or rooms, requiring manual emptying by workers with and shovels. Hazardous solvents, adhesives, plating materials, and pesticides from industries, as well as hazardous asbestos products from construction/demolition activity, are also

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common. The problem of the waste disposal site in Addis Ababa, which is located in Kolfe-Keranyo Subcity, woreda 01 KOSHE (REPI) is a good example how it has been negatively affecting the health and wellbeing of waste disposal workers and dwellers around the disposal site. In line with this, the health impact of the open disposal site on the solid waste disposal workers at the site needs to receive a particular emphasis. Therefore, this paper attempts to associate health risks of waste disposal workers with their working environment.

Photo 1. Repi waste disposal site while it is under fire explosion.

Photo 2. Repi, a common place for all types of waste and scavengers.

TABLE 1. summary of exposure, sources of exposures and health effects from exposure at solid waste disposal sites.

Exposure	Sources	Health effects from exposure
Sharp materials	• hospitals (health care facilities), industries, domestic houses, institutions, business centers, etc	• cuts, injures, punctures, infections(HIV, hepatitis B and C, Tetanus, etc)
Chemicals	• industries, hospitals, institutions, etc	• cancer, allergy, chromosomal abnormalities (hereditary disease), several disease, etc
➢ Arsenic	• Smelting and microelectronics industries, wood preservatives, pesticides, herbicides, fungicides, folk remedies, coal	• Acute arsenic poisoning results in necrosis of intestinal mucosa with hemorrhagic gastroenteritis, fluid loss, hypotension, delayed cardiomyopathy, acute tubular necrosis, and hemolysis. • Chronic arsenic exposure causes diabetes, vasospasm, peripheral vascular insufficiency and gangrene, peripheral neuropathy, and cancer of skin, lung, liver, bladder, and kidney
➢ Cadmium	• Metal plating, pigment, smelting, battery, plastic industries, tobacco, incineration of these products	• Acute cadmium inhalation causes pneumonitis and acute ingestion causes gastroenteritis. • Chronic exposure causes anosmia, yellowing of teeth, emphysema, minor LFT elevations, microcytic hypochromic anemia unresponsive to iron therapy, proteinuria, increased urinary α - microglobulin, calciuria, leading to chronic renal failure, osteomalacia, and fractures
➢ Lead	• Manufacturing of auto batteries, lead crystal, ceramics, demolish or sanding of lead painted houses, plumbing, soldering, lead pipes, contaminated herbal remedies, combustion of lead fuels	• Acute exposure can cause impaired neurotransmission and neuronal cell death; impaired hematopoiesis and renal tubular dysfunction) • At higher levels of exposure, acute encephalopathy with convulsions, coma, and death may occur • Subclinical exposures in children are associated with anemia; mental retardation; and deficits in language, motor function, balance, hearing, behavior, and school performance • In adults, chronic subclinical exposures are associated with an increased risk of anemia, demyelinating peripheral neuropathy, hypertension, interstitial nephritis and chronic renal failure, diminished sperm counts, spontaneous abortions
➢ Mercury	• Merecury, Mercurous,	• Chronic exposure to

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	and mercuric mercury (Hg, Hg+, Hg^2+), exposures occur in some chemical, metal-processing, electrical-equipment, automotive industries; thermometers, dental amalgams, batteries.	metallic mercury vapor produces a characteristic intention tremor and mercurial erethism: excitability, memory loss, insomnia, timidity, and delirium. On neurobehavioral tests: decreased motor speed, visual scanning, verbal and visual memory, visuomotor coordination. • Children exposed to mercury in any form may develop acrodynia ("pink disease"): flushing, itching, swelling, tachycardia, hypertension, excessive salivation or perspiration, irritability, weakness, morbilliform rashes, desquamation of palms and soles.
Leachate	• Decomposition of Solid waste	• Allergy, foul odor (vomiting, nausea, damage to olfactory nerve, headache), asthma, dermatologic disorder, cancer, etc
Landfill gas ✓ (Methane and nonmethane organic compounds, **NMOCs)**	• Nature of Decomposition of Solid waste	• Foul odor (vomiting, nausea, damage to olfactory nerve, headache), asthma, upper respiratory truck disease, irritation of eye , throat and skin, fire accident (explosion) • Neurological (CNS) problems • Cardiovascular problems • Reproductive/developmental problems • Hematologic problems • Cancer (several types of cancer) • Multi organ defects (multi organ dysfunctional
✓ Carbon monoxide	•	• Visual impairment, headache, reduced work capacity • Death (at high dose)
✓ chloroform	•	• Skin (sores) neurological defect, reproductive defect, liver and kidney damage,
Pathogenic microorganisms	• Hospitals (healthcare facilities)	• Infections (bacterial infections, viral infections, fungal infections, parasitic infections)
Land slide	• Unstable heap of solid waste	• Physical injuries, death
Animals (dogs, rats, insects)	• Solid waste (scavengers)	• Animal bite (rabies, malaria,)

II. Methodology and Material

This chapter contains methods, study area, study population, sample size, sampling techniques, data collection instruments, data collection methods, methods of data analysis, ethical considerations and variables of the study.

2.1. Methods of Study

Methodology refers to the systematic way of collecting, analysing and interpreting data in order to produce a result relating to a research problem. Not all methods are suitable for collecting the data needed in relation to the approach. Choice of methodology therefore needs to be based on the problem and the theoretical approach, which in turn will affect the perspective a researcher holds on the real world (Lindsay 1997). Within methodology, it is common to distinguish between a qualitative and quantitative approach.

A qualitative approach is a systematic way of collecting and analysing data, and is a common approach for studying problems that requires a deeper analysis and comprehension of social phenomena. A quantitative approach is a formalistic and a structured way of collecting data. Quantitative methods are characterized by measurable data which can be expressed in numbers or other quantities. This gives a basis for the presentation of frequencies, distributions and correlations. This research is carried out using a combination of qualitative and quantitative methods. The reason for choosing to combine the two methods was to overcome some of the limitations with the use of only one of the approaches, and to increase the validity of the results.

The principal methods employed in this study are well organized questionnaires to gather information on signs and symptoms of some diseases felt by the sample population and experimental method (laboratory test) to determine the health impacts of solid waste disposal workers at Repi (Koshe) due to exposure to chemical and microbial components of the solid waste. In this method 10 ML of blood will be taken from each volunteer sample population using vein puncture technique. Two millimeter venous blood sample will be dispended into dipotasium Ethylene Diamine Tetra Acetate (EDTA) anticoagulant tube and mixed properly. This sample will be used for determination of hematological parameters. Three milliliters venous blood will also be dispended into lithium heparin anticoagulant tube and mixed thoroughly. The plasma derived from lithium heparin anticoagulant will be used for liver functional tests (LFT).

2.2. Study Area

The study area was Repi which is commonly called KOSHE (the open dumping site). KOSHE is located to the south tip of Addis Ababa. It is about 12.5 km away from the center of Addis Ababa city. KOSHE is found at the border of Nifas silk Lafto sub-city and Kolfe Keranio Sub-City. It has been serving as solid wastes disposal site of the municipality of Addis Ababa since 1968. In recent years, majority portion of the site is being reclaimed; some part for gas flaring system and some part for waste to energy plant project. Currently about 7000 m^3 solid waste per day is being dumped at the site. More importantly, nowadays due to the participation of private sectors and poor monitoring systems wastes from industries, hospitals (health institutions) and different organizations are being mixed with municipal solid wastes and dumped together into this site. Presumably, this condition would make the site to be potential source of exposure to different health affecting situations for solid waste disposal workers.

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2.3. Study Population

2.3.1. Sample population

Volunteer solid waste disposal workers at Repi dumping site and control group of comparable age and life style and who were neither solid waste disposal workers nor waste pickers have been taken as sample population

2.3.2. Sample size

A total of 50 sample population has been taken. Thirty five of them were solid waste workers and fifteen of them control subjects. The small sample size was resulted from few numbers of solid waste workers.

2.3.3. Sampling technique

Purposive sampling technique has been employed to select the sample population

2.4. Data Collection

2.4.1. Data collection instruments

Firstly, well-structured questionnaires and interview have been applied to the sample population in order to gather data on signs and symptoms of different health problems of the sample population. Secondly, a standardized laboratory test has been used to determine the health defects of the sample population.

2.4.2. Data collection methods

The questionnaires were prepared in English and translated into Amharic language and distributed to the sample population. A face to face interview was made with sample population to gather detailed information about the health problems of the sample population in relation to solid waste disposal activities.

2.4.3. Data analysis

All obtained data were analyzed using students test and correlation coefficient.

2.5. Ethical Considerations

All study participants were briefed about the purpose of the study including how the study was beneficial to them and for the whole country. They were told that there was not be any invasive procedures involved. Great emphasis was given in explaining the fact that no individual participant was obliged to participate in the study. The decision to participate or not was fully based on his/her willingness. After through discussion an informed written consent was prepared so that each participant was able to decide whether to participate or not after full understanding of the purpose of the study the right to refuse to participate, and that the responses given was confidential to anyone else.

2.6. Variables

2.6.1. Independent variables

Age
Sex
Level of education, etc

2.6.2. Dependent variables

Life style
Level of income
Working condition, etc

2.6.3. Behavioral factors

Alcohol drink
Smoking habit
Use of personal protective device

III. Results and Discussion

This chapter with the presentation and analysis of data collected from the sample population using well- structured questionnaires, field observations and laboratory test. The chapter consists of five major parts i.e., socio-demographic characteristics of the sample population (respondents), work place conditions and exposure of respondents, general history/medical history of respondents, laboratory specimen/sample analysis results of respondents and discussion.

3.1. Socio-demographic Characteristics of the Respondents

As shown in table 2, the age of most of the respondents was between 30 and 40 years (66%) and concerning the educational level majority of the respondents was secondary school (80%).The table also showed that 65.7% of them are married, 28.6% are single and 5.7% are divorced.

TABLE 2. Socio demographic characteristics of respondents, April 2016.

Questions (characteristics)	Responses	Subject group (n = 35)	Control group (n= 15
Sex	Male	30 (86%)	15 (100%)
	Female	5 (4%)	0 (0%)
	Total	**35 (100%)**	**15 (100%)**
Age	<30 years	7 (20%)	2 (13%)
	30-40 years	23 (66%)	10 (67%)
	>40 years	5 (4%)	3 (20%)
	Total	**35 (100%)**	
Educational status	Illiterate	0 (0%)	0 (0%)
	Only read and write	2 (5.7%)	1(6.67%)
	Primary school (1-8th grade)	2 (5.7%)	2 (13.33%)
	Secondary school (9-12th grade)	28 (80%)	8 (53.33%)
	Diploma and above	3 (8.6%)	4 (26.67%)
	Total	35 (100%)	15 (100%)
Marital status	Single	10 (28.6%)	4 (28.67%)
	Married	23 (65.7%)	9 (60%)
	Divorced	2 (5.7%)	2 (13.33%)
	Widowed	0 (0%)	0 (0%)
	Total	**35 (100%)**	**15 (100%)**
Cigarette smoking behavior	Not at all smoking	34 (97%)	15 (100%)
	Sometimes smoking	0 (0%)	0 (0%)
	Daily smoking	1 (3%)	0 (0%)
	Total	**35 (100%)**	**15 (100%)**
Alcoholic behavior	Not at all drinking alcohol	10 (28.6%)	3 (20%)
	Sometimes using alcohol	18 (51.4%)	9 (60%)
	Daily using alcohol	7 (20%)	3 (20%)
	Total	**35 (100%)**	**15 100%)**

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Regarding smoking behavior only a single person from the subject group respondents (solid waste disposal workers) was found to have a habit of cigarette smoking and none from control group respondents (who were not involved in solid waste disposal). Significant numbers of respondents (20% of them) were drinking alcohol daily.

Work place conditions and exposures of respondents

As shown from table 3, majority of the respondents were exposed to solid waste disposal sites for more than 5 years (51.4%). Moreover, the respondents were not using appropriate PPE (personal protective equipment).30 (34.28% of them were using cloth, 10 (28.6%) of them were using glove, 5 (14.28%) of them used shoe (safety shoe) and neither of them were using eye goggle and helmets.

TABLE 3. Health status assessment results for solid waste disposal workers, April 2016.

Questions (characteristics)	**Responses**	**Subject group (n = 35)**
Exposure to work place in years	1 – 5 years	10 (28.6%)
	5 – 10 years	18 (51.4%)
	More than 10 years	7 (20%)
	Total	**35 (100%)**
Using PPE while in work at disposal site (multiple answer is possible)	Glove	10 (28.6%)
	Safety shoe	5 (14.28%)
	Cloth (tuta)	30 (34.28%)
	Helmets	0 (0%)
	Eye goggle	0 (0%)
	Scarfs	2(5.7%)
	Nothing I use	5 (14.28%)
	Total	**It is not additive**
Do you participate in sorting and collecting valuable materials?	Yes	13 (37.14%)
	No	22 (62.86%)
	Total	35 (100%)
Do you eat food waste in the disposal site?	Yes	9 (25.7%)
	No	26 (74.3%)
	Total	**35 (100%)**
Do you have any contact with the following materials in the site? (multiple answer is possible)	Blood (materials contaminated with blood)	25 (71.4%)
	Feces	3 (8.6%)
	Air borne dust	35 (100%)
	Chemicals	35 (100%)
	Rats/mice	0 (0%)
	Flies	35 (35%)
	Sharp materials (knife, needle, scissor, blade)	28 (80%)
	Total	**It is not additive**

The table has also shown that 13 (37.13%) of the respondents of solid waste disposal workers were participate in sorting and collecting valuable materials (plastics scrape of metals, glasses and others) from the waste. Amazingly, 9 (25.7%) of the subject group respondents were eating the food-waste, which was supposed to be disposed at the landfill. Almost all of the respondents were contaminated with air borne dust, chemicals, flies, sharp materials, and blood in the disposal site.

General history/medical history of the respondents

Table 4 has shown that majority of the health problems of solid waste disposal workers were associated with the nature of the work they do. The respondents said that physical injury (51.4%), skin problems (57.14%), respiratory problems (74.29%), GIT problems (60%), headache, nausea and vomiting (100%) and vision problems (62.57%) are their main health problems and they are experiencing them after they became solid waste disposal workers.

TABLE 4. Health history of respondents.

Health history assessment	Respondents/subject group (n = 35)		
	Before becoming landfill worker	After becoming landfill worker	Nothing
Physical injury (fracture, damage, strain, cuts)	10(28.6%)	18(51.4%)	7(20%)
Skin problems (dryness, rash, bruise, nodules)	5(14.28%)	20(57.14%)	10(28.6%)
Respiratory problems (asthma, TB, pneumonia)	7(14.28%)	26(74.29%)	2(5.71%)
GIT problems (diarrhea, obstruction, ulcer)	10(28.57%)	21(60%)	4(11.43%)
Frequent Headache, nausea and vomiting problems	0(0%)	35 (100%)	0
Vision problems (trachoma, cataract, redness)	10(28.57%)	22(62.86%)	3(8.57%)
Parasites	15(42.86%)	13(37.14%)	7 (20%)
Any cancer (skin, blood, lung, kidney, liver)	0 (0%)	1(2.86%)	34(97.14%)
BP (blood pressure)	10(28.57%)	15(42.86%)	10(28.57%)
DM (diabetes mellitus)	2(5.7%)	3(8.6%)	30(85.7%)
Heart problem (CHF, MI, Angina, valve defect)	0(0%)	2(5.7%)	33(94.3%)
Kidney problems (nephritis, kidney failure)	1(2.86%)	2(5.71%)	32(91.43%)
Liver problems (hepatitis B, cellular damage)	1(2.86%)	2(5.57%)	32(91.43%)
Hearing problems (hearing defect)	0(0%)	3(8.57%)	32(91.43%)

Laboratory specimen/sample analysis result of respondents

A baseline hematological data for solid waste disposal workers and control groups were established as in table 5. There were some slight decreases in hemoglobin (Hb) levels, mean hematocrit concentration, platelets, etc., as compared to the control groups. Lymphocyte counts were high for the solid waste disposal workers compared to the control group.

TABLE 5. Hematological values of solid waste disposal workers and control groups: April, 2016.

Hematological parameters	Subjects (n =35)		Controls (n = 15)		Df	t-value	Probability (p-value)
	no	Mean ±SD	No	Mean ±SD			
Hb (g/dL)	35	13.43 ± 1.14	15	14.69 ± 0.40	48	5.73	< 0.01
Hematocrit (%)	35	37.13 ± 3.22	15	41.77 ± 2.74	48	4.64	< 0.01
WBC ($x10^9$/L)	35	6.35 ± 1.86	15	7.32 ± 1.21	48	2.12	< 0.01
Platelet ($x10^9$/L)	35	236.15 ± 104.33	15	282.40 ± 33.76	48	2.35	< 0.01
Neutrophils (%)	35	42.60 ± 11.11	15	48.65 ± 5.87	48	6.66	<0.01
Lymphocytes (%)	35	50.42 ± 11.30	15	32.83 ±5.32	48	7.45	< 0.01
Monocytes (%)	35	3.05 ± 2.41	15	5.77 ± 2.03	48	4.12	< 0.01
Eosinophil (%)	35	3.11 ± 2.36	15	2.29 ± 1.04	48	1.56	> 0.01
Basophils (%)	35	0.51 ± 0.58	15	0.45 ± 0.43	48	0.43	> 0.01

- P<0.01 is significant

The baseline data for liver functional test (LFT) shows there was significant increase in the aspartate amino transaminase (AST) of the solid waste disposal workers (table 6).

TABLE 6. Baseline liver function values of solid waste disposal subjects and controls.

Liver function values (liver functional test)	Subjects (n =35)		Controls (n = 15)		Df	t-value	Probability (p-value)
	No	Mean ±SD	No	Mean ±SD			
Total bilirubin (µmol/L)	35	9.92 ± 5.25	15	10.81 ± 1.94	48	-0.87	> 0.01
Conjugated bilirubin ((µmol/L)	35	2.56 ± 2.94	15	2.34 ± 1.34	48	0.36	> 0.01
ALT (U/L)	35	6.51 ± 4.25	15	6.43 ± 2.88	48	0.08	> 0.01
AST (U/L)	35	11.19 ± 2.36	15	8.97 ± 4.07	48	2.41	< 0.01
ALK.Phos (U/L)	35	19.83±5.44	15	20.34±3.28	48	-0.83	> 0.01

P<0.01 is significant

IV. DISCUSSION

Solid waste today has become the number one serious environmental problem facing the city Addis Ababa with its consequent effects on the pollution of water, air and soil. The industrialization boom era with its high pace of consumption and population open the flood gate for serious waste generation in the city (Addis Ababa). At the moment the city is faced with the problem of solid waste management.

As the people who are engaged in solid waste disposal spend half of their times and days clearing the heaps of refuse, there is every likelihood that may affect their health and socio-economic well-being. The result obtained from this study was based on the research findings carried out in KOSHE/REPI open dumping site, Addis Ababa, Ethiopia. There is death (three deaths) information on health impact assessment of solid waste disposal workers in KOSH/REPI, Addis Ababa; hence, this research work was undertaken to provide at least a baseline data from which other future researchers on related issues could refer to. Even though waste disposal business has its attendant risks or problems, it still provides means of livelihood to youths and adults, which make them to carter for themselves and families. The information gathered from the questionnaires that were administered for the solid waste disposal workers showed that majority of them had symptoms such as frequent headache, nausea, vomiting, irritation of eye and nose, itching of skin, soreness of throat, irritation stomach, sometimes diarrhea and libido (sexual dysfunction). These symptoms may be attributed to exposure to some level of pollutants present in the working environment.

The general history/medical history and physical examination assessment results showed that solid waste disposal workers reported higher prevalence of respiratory disease (74.9%), vision problems (62%), GIT disease (60%), skin disease (57.14%) and physical injury (51.4%). These findings agree with the report of Nath JK, et al (2002) and konnoth N. (1998).

The lymphocyte count showed significant increase in the case of solid waste disposal workers. The lymphocytosis in the category of solid waste disposal workers may indicate the presence of bacterial infections, protozoal infections and granulomatous process like hypersensitivity pneumonitis. A mild eosinophilia was observed in the solid waste disposal workers, meaning that there might be allergic disorders and helminthic infections. These findings agree with the report of Cheesbrough (2002), Huisman M. (1994),

A mean AST (aspartate amino transaminase) level of solid waste disposal workers was significantly higher than that of the control subjects. Raise AST level are associated with hepatocellular damage and viral hepatitis. Because AST widely distributed in the body tissues, many other diseases involving cellular injury may be accompanied by increased in AST levels, such as sever bacterial infections, malaria, and pneumonia. This finding agrees with the report of Wilson and Waugh (1996) and Cheesbrough (2002).

4. Major Findings, Conclusion and Recommendations

This part of the paper deals with major findings, the conclusion reached at and the recommendations forwarded on the basis of the findings.

4.1. Findings

Higher prevalence of respiratory diseases, skin diseases, eye diseases, gastrointestinal diseases and allergic problems were reported by solid waste disposal workers. Frequently experience of headache, nausea, vomiting, eye irritation, soreness of throat and depression were reported by solid waste disposal workers. An indication of cancer and other irreversible health damage situations for solid waste disposal workers. No education about health and work place safety issues for solid waste disposal workers. Inadequate provision of personal protective device.

4.2. Conclusion

The study reveals that, despite the presence of the constitutional rights of the citizens to live on clean environment and many proclamations and international conventions to avoid health risks for workers, nothing had done for solid waste disposal workers. Their health and even the generation to come from them is endangered.

4.3. Recommendations

Periodic physical examination (evaluation) of the solid waste disposal workers should be made as a policy in order to monitor their health status. Blood chemistry analysis for heavy metals (Arsenic, lead, mercury, chromium and cadmium) should be done in order to have data on teratogenicity, carcinogenicity, mutation, birth defects and other hereditary disease status of the solid waste disposal workers. Adequate protective wears (personal protective equipment, PPE), such as respiratory masks, hand gloves, protective clothing and safety shoes should be provided to solid waste disposal workers, to ensure their safety and that of the public in general. Regular health education on health and safety issues for solid waste disposal workers is very important to develop Behavioral Based Practice (BBP).

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