Life Sciences 202 (2018) 182–187

Contents lists available at ScienceDirect

Life Sciences

journal homepage: www.elsevier.com/locate/lifescie

Evaluation of hematological and biochemical parameters of pesticide retailers following occupational exposure to a mixture of pesticides

Masoud Neghab[a], Hamed Jalilian[b,*], Shekoufeh Taheri[b], Mohsen Tatar[c], Zeynab Haji Zadeh[b]

[a] Research Center for Health Sciences, Institute of Health, Department of Occupational Health Engineering, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran
[b] Student Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran
[c] Department of Biochemistry, School of medicine, Shiraz University of Medical Sciences, Shiraz, Iran

ARTICLE INFO

Keywords:
Pesticide
Retailer
Hepatotoxicity
Nephrotoxicity
Hematotoxicity
Neurotoxicity

ABSTRACT

Aims: This study was undertaken to ascertain whether light occupational exposure to pesticides by retailers might be associated with any liver, kidney, nervous system dysfunction or hematological abnormalities.

Main methods: In this cross-sectional study, 70 male pesticide retailers (cases) and 64 male subjects, randomly selected from the constructions workers of city council contractors, as the referent group, were investigated. Urine and blood samples were taken from all subjects for urine analysis, hematological and biochemical parameters. Data analysis was conducted through SPSS v.19 using *t*-test and chi-square test.

Key findings: The results of urine analysis showed that the frequency of abnormal urine tests was significantly higher in cases than in referent individuals. Similarly, the results of CBC showed that the mean values of monocyte, hemoglobin, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin and platelet distribution width were significantly lower, and mean corpuscular hemoglobin concentration and red blood cell distribution width were significantly higher in retailers. No significant differences were found for other parameters.

Significance: These findings indicate that an association exists between exposure to pesticides by retailers and early subtle and sub-clinical changes in the urine tests and hematological parameters. Engineering measures are recommended to eliminate exposure to pesticides and to prevent its associated outcomes.

1. Introduction

"Pests" are referred to as the living organisms that are a detrimental or potentially detrimental threat to the health of human being. Pesticides are referred to as any types of agent or mixture that are used to prevent, reduce, confront with, or destroy any type of pests including insects, rodents, ticks, fungi and herbs [1]. An estimated two million tons of active pesticide ingredients are used annually [2], mainly in agriculture, out of which 45% is used by Europe alone, 25% in the United States of America, and 25% in the rest of the world, and 5% in unknown locations [2].

Statistical Yearbook of Iran (2011) reported that, totally, 3574 tons (about 0.2% of world usage) of active pesticide ingredients including granules and oils (56.1%), herbicides (33.1%), fungicides (5.2%), insecticides (4.5%), acaricides (0.85%), and others (0.25%) are sold annually in the country [3].

Occupational exposure to pesticides is common during their production, storage, transportation, retailing and application of these compounds [4]. Many retail establishments sell pesticides such as insecticides, herbicides, acaricides, fungicides, and disinfectants for home, gardens, and agricultural purposes. Therefore, pesticide retailers are exposed to a complex mixture of organophosphates, organochlorines, carbamates, pyretroids, and other kinds of toxic agents in the stores [5]. Studies have reported toxic effects of pesticides on different organs of the human body including blood [6], kidney [7,8], liver [6], lung [9], skin [10], nervous system [11] and also fecundity status [12]. However, these studies have mainly focused on some specific jobs including farmers [13,14], pesticides appliers [15,16], and workers who have been employed in the pesticides factories [17,18] rather than pesticide retailers.

The first study about ill effects caused by exposure to a complex mixture of pesticides among the individuals employed in pesticides retail outlets was conducted by Kesavachandran et al. (2009) who reported respiratory, neurological, gastrointestinal and cardiovascular disorders [5]. Hotton et al. reported different levels of Dichlorodiphenyltrichloroethane (DDT), Dichlorodiphenyldichloroethane

* Corresponding author at: Department of occupational health engineering, Institute of Health, Shiraz University of Medical Sciences, P.O. Box 71645-111, Shiraz, Iran.
E-mail address: Jalilianh@hotmail.com (H. Jalilian).

https://doi.org/10.1016/j.lfs.2018.04.020
Received 10 January 2018; Received in revised form 4 April 2018; Accepted 12 April 2018
Available online 13 April 2018
0024-3205/ © 2018 Elsevier Inc. All rights reserved.

(DDD), Dichlorodiphenyldichloroethylene (DDE), and Aldrin in the blood of pesticide retailers. The total content of DDT (sum of DDE, DDD and DDT) in the whole blood of retailer samples was 0.062 mgL^{-1} [19]. The Study of Remor et al. reported adverse genotoxic effects in the farm workers who were occupationally exposed to a complex mixture of pesticides as compared to controls [16]. Moreover, the study of Rojas-Garcia et al. indicated that the serum activities of Gamma glutamyl transferase (GGT) and aspartate aminotransferase (AST) were significantly higher in retailers than in a control group, but mean values of red blood cell (RBC) and white blood cell (WBC) count showed no significant difference [20].

Given the above, it seems that there is a paucity in studies related to the health of pesticide retailers and this issue despite its importance has not been thoroughly investigated. Therefore, the present study was undertaken to ascertain whether (or not) exposure to pesticides by retailers under normal working conditions is associated with any hepatotoxic, nephrotoxic, hematotoxic or neurotoxic responses.

2. Material and methods

2.1. Study population and design

In this cross-sectional study, firstly, the researchers referred to Pesticide Retailer Union (PRU) of Shiraz, capital of Fars, Iran, and obtained a list of all registered pesticide retailers of the city and the list of pesticides that were sold in individual stores.

Of 88 active registered stores, 70 stores (pesticide retailers) were randomly selected from the list. Then, two researchers referred to the selected stores and requested the retailers to complete a screening questionnaire that contained inclusion and exclusion criteria, in the Yes/No format questions. The inclusion criteria were a daily working hour of at least 6 h, one-year experience in a pesticide store and being responsible for all the tasks of store including handling, packaging, cleaning, and selling. The exclusion criteria were past medical or family history of liver, kidney, neurological or blood illnesses. In addition, they should have no history of exposure to other toxic chemicals, massive muscle mass, high consumption of meat, and routine/continuous alcohol or drug consumption such as gentamicin, aspirin, cyclosporine, and cimetidine.

All participants who met the inclusion criteria completed the questionnaires. The researchers selected another store if a retailer was not volunteer or did not meet inclusion criteria (four cases).

Furthermore, 64 male participants were randomly selected from the constructions workers of city council contractors while considering the eligibility criteria.

2.2. Questionnaire data

The general characteristics of participants were collected from them by a questionnaire containing questions regarding age (year), BMI (kg/m^2), work experience (year), average weekly work (hour), length of smoking (year), number of smokers (%), number of cigarettes smoked (per day) and marital status (%).

The history of using personal protective equipment (PPE) including overalls, hat or cap, respirators (any type), handkerchief, gloves, boots, and eyeglasses [20] was investigated by a self-report questionnaire, in which the participants were asked to determine the status of the use of PPE and also participation in any type of toxicology educational course. In addition, the retailers were asked to indicate the pesticides they sell based on the pesticide list of the PRU. Moreover, they could add more pesticides if they were not in the list.

2.3. Sampling and analyses

2.3.1. Sample collection

A medical expert took fasting blood samples (10 mL) from the antecubital vein of the participants in the morning hours as soon as they attended the workplace. In addition, urine samples were collected on site [21]. 5 mL of blood sample was transferred to sterile Ethylenediaminetetraacetic acid (EDTA) vacutainers for the use of hematological assays. Another 5 mL was transferred to plain vacutainer to obtain the serum for biochemical assays. All samples were coded (the same as the questionnaires' code for each participant), stored in a cold box, transferred to the laboratory and processed within 2 h of sample collection [21]. The plain vacutainer samples were immediately centrifuged at 400 × *g* for 20 min to separate plasma and the erythrocyte package, which were stored at −20 °C for determination of cholinesterase activities and biochemical analyses [20].

2.3.2. Hematological assays

Hematological parameters included WBC differential, RBC count, WBC count, hemoglobin (Hb) and hematocrit (HCT) levels, platelet (PLT), plateletcrit (PCT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), MCH concentration (MCHC), red blood cell distribution width (RDW), platelet distribution width (PDW), and mean platelet volume (MPV) were determined using a hematology cell counter (Nihon Kohden, Tokyo, Japan), after calibration of the instrument with samples from the University Central Laboratory at Shiraz Namazi Hospital.

2.3.3. Biochemical assays

The serum level of blood urea nitrogen (BUN), creatinine, calcium, phosphorus, AST, alanine aminotransferase (ALT), alkaline phosphates (ALP), total bilirubin, and direct bilirubin were analyzed by an auto analyzer (model BT 1500, Biotecnica Instrument Co, Rome, Italy). In addition, the activities of plasma (BChE) and red blood cell (AChE) cholinestrases were measured by Ellman et al. method [22].

2.3.4. Urine analysis

All urine samples were visually screened by the dipstick colorimetric method (Convergys® Urine Matrix test strips, Convergent Technologies, Coelbe, Germany) and the test strips were immersed in a tube of fresh urine for 2 s, then the strips were manually shaken to remove the excess amounts of urine and then 60 s later they were optically matched with an indicator provided by the manufacturer for quantitative (pH and specific gravity) or qualitative (glucose, protein, blood, ketone, nitrite, bilirubin, urobilinogen, leukocytes, and ascorbic acid) measurement of urine parameters [23]. The screened samples were checked by a specialist under a microscope (Carl Zeiss standard 20 450,807 Binocular Transmitted Light Microscope, Carl Zeiss AG, Germany) at 40× magnification. In the urine sediment analysis, 10 high-power fields (HPF) were estimated and the counts were given as an average per HPF. A cut-off point of > 2 cells/HPF was considered as abnormal value for the number of average RBC and WBC in the urine [24]. In order to eliminate the operator and instrumental errors, one specialist on a double-blind basis carried out all tests, after calibration of the instruments by standard methods.

2.4. Ethical consideration

The protocol of the study was approved by the university ethics committee. All participants were informed about the protocol of the study before they gave their consent. The participants were able to withdraw from the study at any time. All participants answered the questionnaires anonymously, and they completed informed consent of SUMS for participation in the current study. All collected data were kept confidential and were not available to anyone. The hematological, biochemical, and urine analysis results were Interpreted and delivered to the subjects confidentially.

Download English Version:

https://daneshyari.com/en/article/8535074

Download Persian Version:

https://daneshyari.com/article/8535074

Daneshyari.com