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Original Research Article

Role of health awareness among malaria control workers in their occupational health and safety practices

Mohamed Osman Elamin Bushara*

Faculty of Public Health & Informatics, Umm Al-Qura University, Makkah, Saudi Arabia

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***Correspondence:**
Dr. Mohamed Osman Elamin Bushara,
E-mail: mohsm71@yahoo.com

ABSTRACT

Background: The study conducted at Khartoum North, Khartoum state, Sudan to determine the role of health awareness among malaria control workers in their occupational health and safety. All workers (80) were selected for the study.
Methods: This was a quasi-experimental study concentrating on the role of awareness among Malaria control program workers who were using insecticides in their occupational health and safety practices, where questionnaire, interviews, intervention program used.
Results: The study clarified that there is a high significant change in practices among malaria control workers concerning the use of personal protective equipment from 68% to 86% after intervention, also there was a significant change in practices among malaria control workers concerning the using always of personal protective equipment's from 75% to 86% after intervention.
Conclusions: The study concluded that the hazard of insecticides to the Malaria control workers occupational health is high, because of their limited awareness about the risks resulted from it, health awareness interventions can tackle this problem.

Keywords: Occupational health, Malaria workers, Khartoum North

INTRODUCTION

Malaria is a protozoal disease caused by infection with a parasite of the genus *plasmodium* and transmitted to man by certain species of female *Anopheles* mosquitoes.

The vision of National Malaria control program in Sudan is the reduction of malaria–related morbidity and mortality in a way that Malaria is no longer a public health problem that hinders the socioeconomic development in the country. This will contribute to the attainment of the MDGs by the year 2015.

The objective of National Malaria control program Strategic Plan 2011-2015 is to reduce the morbidity and mortality of malaria by 50% by 2015 all over the northern Sudan (compared to reported cases in 2009). Due to the success story in Khartoum this updated Strategic Plan envisages certain areas (Northern, Red Sea, River Nile, Gezira, White Nile) aiming malaria free 25 status where the overall commitment, financing and health system potential indicate higher potential for significant reduction of local malaria transmission with ultimate goal of malaria elimination: the objective for such selected areas was: By 2015 reported malaria incidence, with 100% laboratory confirmation of malaria diagnosis, will be reduced by at least 80% as compared to 2009 and will reach the level of 10 cases per 1000.[1]

Because of the actions for the control of Malaria transmission using different types of insecticides great side effects arises, the chemicals used for destroying insect pests were largely inorganic chemicals, such as compounds of lead and arsenic, which are poisons for humans and animals. Some organic chemicals of plant origin, such as nicotine, pyrethrum and rotenone were also used for pest control.

Insecticides types used in Malaria control in Sudan are:

Malathion

Malathion is an insecticide in the chemical family known as organophosphates. Products containing malathion are used outdoors to control a wide variety of insects in agricultural settings and around people's homes. Malathion has also been used in public health mosquito control and fruit fly eradication programs. Malathion may also be found in some special shampoos for treating lice. Malathion was first registered for use in the United States in 1956.

Exposure to Malathion and occupational hazards

Human could be exposed to malathion if get it on skin or breathe it in, or if use a product and eat, drink, or smoke afterwards without washing hands. People who apply products containing malathion may be exposed if they do not wear the proper protective equipment. Human could also be exposed to residues of malathion if you ate food that had been treated with this pesticide.

People who were exposed to enough malathion to become sick feet nauseated or vomited, have muscle tremors, cramps, weakness, shortness of breath, a slowed heart rate, headache, abdominal pain and diarrhea.

Researchers fed rats with malathion for up to two years and to mice for a year and a half. They found no evidence of increased cancer in the treated animals. Other studies using higher doses of malathion in rats and mice found that they developed liver cancer. The United States Environmental Protection Agency (U.S. EPA) has determined that there is "suggestive evidence of carcinogenicity but not sufficient to assess human carcinogenic potential by all routes of exposure," for Malathion.[2]

Abate

Abate (Temephos) is an organophosphorus compounds. It is a brown viscous liquid, soluble in petroleum solvents. Because of its low toxicity, it has been extensively used in India for the control of *Anopheles.stephensi* in wells and in domestic water containers with good result at a dosage not greater than 1.0 ppm. Abate is less effective as Adulticide.[2]

Diazinon

Diazinon is a liquid product. Being volatile, it kills insects not only by direct contact, but also by fumigant action. It has proved effective in the control of DDT - resistant insect. At a dosage of 60 to 100 mg per sq. foot, it has given satisfactory control of flies and mosquitos. Diazinon is more toxic to man than malathion or fenthion.

Diazinon is an insecticide that belongs to a group of chemicals known as organophosphates. It is used in agriculture to control insects on fruit, vegetable, nut and field crops. It is also used to make ear tags for cattle. Diazinon has been used in the United States since 1956. Before the cancellation of residential uses in 2004, diazinon was used for household insects, lawn and garden insect control, and to control insects on pets.[2]

Exposure to Diazinon and occupational hazards

Diazinon exposure can happen on skin or breathing it in. Unless working an agricultural setting where diazinon is in use, being exposed in these ways is not likely.

Diazinon exposure affects the nervous system of insects, people, and pets in the same basic way. However, the signs and symptoms from exposure may be different. Symptoms of diazinon exposure can happen within minutes or 12-24 hours after the exposure. The signs and symptoms from a brief exposure can last several days or even weeks. During this time, the body is replacing the chemicals needed for proper nervous system function.

Diazinon exposure, whether from ingestion, skin contact, or inhalation can result in nervous system health effects. These effects may include watery eyes, runny nose, drooling, loss of appetite, coughing, urination, diarrhea, stomach pain, and vomiting. Larger exposures can cause more severe signs and symptoms, including head and body tremors, muscle spasms or stiffness, muscle weakness or paralysis, rapid heart rate, difficulty breathing, seizures, convulsions, or coma. Overall, it is fairly low in toxicity when inhaled, ingested or when it gets on the skin, so minor exposures are not likely to cause severe symptoms. However, small exposures to diazinon can cause mild skin or eye irritation.

Long-term exposure to diazinon in humans can change the normal level of chemicals in the nervous system without any noticeable effect. Animal studies have also shown that long-term exposure to high doses of it can lead to pancreatic damage as well as some reproductive or developmental effects in mothers or their off spring.[2]

Permethrin

Permethrin is an insecticide in the pyrethroid family. Pyrethroids are synthetic chemicals that act like natural extracts from the chrysanthemum flower. Permethrin is

used in a number of ways to control insects. Products containing permethrin may be used in public health mosquito control programs.

Exposure to permethrin and occupational hazards

People can be exposed to pesticides by eating them, breathing them in, getting them on their skin, or getting them in their eyes. Permethrin may be breathed in if a spray or fogger is used indoors, or if wind causes a spray or dust to be blown in someone's face. Dogs may be exposed to permethrin in products that are applied to their skin for flea and tick treatments. People can have skin exposure or breathe in products containing permethrin while applying the products, or during public health mosquito control efforts. Permethrin may be eaten if people forget to wash their hands after using products that contain permethrin.[2]

There are remarkable occupational hazards arising from insecticides handling among malaria control workers, awareness on these hazards and safety measures play crucial role in eliminating it among them, the study concentrated on the role of health awareness among malaria control workers in the control of insecticides occupational hazards.

Objectives of the study

General objective

To study the role of health awareness among malaria control workers in the control of insecticides occupational hazards.

Specific objectives

- To assess the present situation of health awareness regarding insecticides occupational hazards among malaria control workers.
- To increase awareness of workers regarding occupational hazards of insecticides handling.
- To encourage the use of self-protection measures among the workers.

METHODS

Study design

A quasi-experimental study was conducted in Khartoum North province among malaria control workers to study the role of health awareness among Malaria control workers in the control of insecticides occupational hazards.

Procedures of study

Preliminary survey was conducted in order to assess Knowledge, attitudes and practices of malaria control workers towards occupational hazards resulting of chemical insecticide handling using the following methods:

Questionnaire

Appropriate questionnaire was used to assess knowledge, attitudes and practices of malaria control worker related to chemical insecticide handling and related occupational hazards.

Observation

Observation focused on workers behavior towards the maintaining of safety practices during handling insecticides.

Interviews

Supervisors were interviewed for their responsibilities towards the workers safety and provision of protective measures.

Reports and records

To gain information about the recorded cases of occupational diseases and medical examination results among the workers.

Intervention

Intervention for six months from September 2015 to March 2016 for three groups through:

Study area

Khartoum North covers an area of about 455 km^2, located between the River Blue Nile from the South and boundaries of the River Nile state from North, East Nile province on the East and the River Nile on the West.

Study population and sample size

The target population was malaria control workers whom were handling the chemical insecticides, were about 80 workers (38 larval control workers, 9 fog workers, 4 storage workers, 29 supervisors).

Study period

Ten months from August 2015 to June 2016

Selection criteria

Due to the limited number of workers, all of 80 workers selected for the study.

Ethical approval

Ethical approval had been obtained from Khartoum state ministry of health.

Statistical analysis

The data was statistically analyzed using Statistical Package for Social Sciences (SPSS) program version (20), and a full set of tables and graphs was prepared.

RESULTS

Table 1 reveals that 70% in post-test mentioned all workers knows personal protective equipments, while only 26.25% in pre-test know it. t test=13.405 p=0.000 showing high significant change.

Table 1: Knowledge of personal protective equipment's among malaria control workers (n=80).

	Pre		Post	
Variable	**No**	**%**	No	**%**
Muzzle	16	20	8	10
Overalls	7	8.75		
Overalls gloves glasses muzzle	11	13.75	4	5
Overalls gloves muzzle	21	26.25	8	10
Gloves muzzle	7	8.75	4	5
No answer	8	10	-	-
All what mentioned	10	12.5	56	70
Total	80	100	80	100

t=13.405; df= 79; p-value (significant)=0.000.

Table 2: Use of personal protective equipments among malaria control workers during their duties (n=80).

Variable	Pre		Post	
	No	%	No	%
Yes	30	68	24	86
No	14	32	4	14
Total	44	100	28	100

t=2.531; df=79; p alue (significant)=0.000.

Table 3: Practice of using personal protective equipment's always by malaria workers (n=80).

Variable	Pre		Post	
	NO	%	NO	%
Yes	33	75	24	86
No	11	25	4	14
Total	44	100.0	28	100.0

t=2.121; df= 27; p value (significant)=0.043.

Table 4: Knowledge about first aid of insecticides poisoning among malaria control workers (n=80).

Variable	Pre		Post	
	No	%	No	%
Yes	20	25	60	75
No	60	75	20	25
Total	80	100	80	100

t=5.132; df=79; p value (significant)=0.000.

Table 5: Practices of malaria control workers when contaminated with insecticides (n=80).

Variable	Pre		Post	
	No	**%**	**No**	**%**
Wash the place with soap and water	65	81	80	100
Nothing	15	19	0	0
Total	80	100	80	100

t=4.270; df= 79; p value (significant)=0.000.

Table 6: Malaria control workers whom clean hands and face after handling insecticides (N=80).

Variable	Pre		Post	
	No	%	No	%
Yes	70	87.5	80	100
No	10	12.5	0	0
Total	80	100	80	100

t=23.516; df=79; p value (significant)=0.000.

In Table 2, There is high significant change in practices among malaria control workers concerning the use of personal protective equipment from 68% to 86% after intervention t test=2.531 p=0.000 showing high significant change.

In Table 3, there is a significant change in practices among malaria control workers concerning the use of personal protective equipment always from 75% to 86% after intervention t test=2.121 p=0.000 showing a significant change.

Table 4 reveals that 75% of malaria control workers in post-test were knowledgeable about first aid of insecticide poisoning while percentage was 25% in pre-test. t test=5.132 p=0.000 showing high significant change.

Table 5, Showing 100% of malaria control workers in post-test have good practice towards insecticide contamination while percentage was 81%in pre-test. t test=4.270 p=0.000 showing high significant change.

Table 6, almost all (100%) of malaria control workers in post-test have good practice towards cleaning hands and face after handling insecticides while percentage was 87.5% in pre-test. t test=23.516 p=0.000 showing high significant change.

DISCUSSION

The study revealed that knowledge about the personal protective equipments used in insecticide application increased significantly, in pre-test most of workers (26.25%) mentioned only overalls gloves and muzzle.

In the post test after training most of workers (70%) identify all equipment's (overalls, gloves, glasses, muzzle and boot hat), showing significant increase of the knowledge (p>0.05) due to the intervention.

This agreed with the study of Salameh et al, in Lebanon which studied the knowledge, attitude and practice of pesticides, they concluded that knowledge of importance of personal protective equipment's was low, the preventive measures they took were low, and the lower their knowledge was, the lower were the preventive measures applied, Pesticide safety education is necessary in order to induce protective behavior among workers.[3]

The use of personal protective equipment by the workers was low, which increased from (68%) in pre-intervention to (86%) in post-intervention showing high significant change (p<0.05) due to health education intervention, also there was increase from (75%) to (86%) in continues, correct use of personal protective equipment, showing significant change (p<0.05).

This is agreed with the study of practices in pesticide handling and the use of personal protective equipment in Mexican agricultural works by Blanco et al, which clarified that workers have a low rate of correct usage of personal protective equipments, needs of health education to improve their practices.[4]

Knowledge about first aid of insecticide poisoning increased from (25%) in pre-intervention to (75%) in post-intervention after training showing high significant change (p<0.05).This increase was due to the health education intervention.

This agrees with the study of Lekei et al, which concluded that training on hazards, classification, and health effects is essential in reducing pesticides risks.[5]

Behavior and practice of workers increased toward cleaning contaminated area with water and soap from 81% in pre-intervention test to 100% in the post-intervention test showing high significant change (p>0.05), also 100% of malaria control workers in post-test have good practice towards cleaning hands and face after handling insecticides while percentage was 87.5%in pre-test, this increase was due to the health education intervention.

This agreed with the study of Edward et al, in their study titled (malathion poisoning in Pakistan malaria workers), which clarified that personal hygiene practices and cleaning of affected body reduce the risks of insecticides.[6]

CONCLUSION

The study concluded that the hazard of insecticides to the malaria control workers occupational health is high, because of their limited awareness about the risks resulted from it accordingly the safety measures is not followed, health awareness interventions can tackle this problem.

The health awareness intervention caused remarkable increase in the knowledge and awareness of the malaria control workers, promotes attitude towards the use of personal protective equipment, and positively changed the wrong practices, which in turn decreases the illness due to insecticides occupational hazards.

Recommendations

1. Preparation of health education, promotion activities for workers on how to avoid insecticides occupational risks.
2. Training programs on the skills needed to avoid insecticides occupational hazards2
3. Establishment of occupational health and safety program for workers by the Malaria control program.
4. Periodic medical checks for Malaria control workers before and during employment.

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