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Unrevealed paraquat exposure cases in Rayong Province, Thailand

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Abstract

The prevalence of paraquat exposure and its health effects have been described in many parts of the world. However unrevealed paraquat exposure cases are still common in developing countries. Here we present cases of chemical keratoconjunctivitis due to occupational exposure to paraquat in Rayong Province, Thailand. All subjects were workers in agricultural sectors whose job responsibilities included mixing and spraying paraquat without proper protective equipment. The subjects reported eye irritation and pain, chemical keratoconjunctivitis was ultimately diagnosed. This report presents unrevealed cases of occupational exposure to paraquat in Thailand, a country where occupational injury and illness recording and reporting systems are not well established. It has not yet been established whether paraquat exposure in the agricultural sectors has resulted in chronic health effects in Thailand. Our data suggest that comprehensive health check-ups for farmworkers and systems for the prevention of paraquat exposure systems should be implemented to reduce the adverse health effects of this chemical.

Keywords: Chemical keratoconjunctivitis, Occupational exposure, Paraquat, Prevention

Introduction

Paraquat is a bipyridyl-group herbicide that is effective and relatively safe for environment (1-2). For these reasons, paraquat has become one of the most widely used herbicides worldwide over the last 60 years. However, ingestion of paraquat is lethal, even at small dosage (3). In 2015, Thailand imported more than 30 million kilograms of paraquat (4), in contrast, many countries have banned its use (5-6). In humans, paraquat is mainly absorbed by inhalation and ingestion, although it can also be taken up through dermal exposure via damaged skin. Common exposure symptoms include abdominal pain, acute respiratory distress, burns in the mouth, diarrhea, loss of appetite, nausea, shortness of breath, rapid heartbeat, and vomiting.

Other symptoms include nosebleeds, skin fissures, peeling, burns and blistering, eye injuries, and nail damage. Paraquat generates free radicals and lipid peroxidation, causing cell death (7). Furthermore, paraquat causes severe pulmonary inflammation, which in turn develops into pulmonary fibrosis. Paraquat also causes liver and kidney failure (3,8). A urine dithionite test can be used to assess paraquat exposure (9-10). Regarding long-term adverse effects, some evidence suggests that paraquat is associated with Parkinson's disease (11-12). Additionally, many injuries and accidents due to occupational and non-occupational paraquat exposure have been unreported in Thailand because of the poor health surveillance system. Rayong is an eastern province that is well-known for its industrial and agricultural areas. A variety of pesticides are used in this province. Occupational conjunctivitis rarely occurs in Thailand. This study reports a case of paraquat exposure causing occupational keratoconjunctivitis among farm workers in Thailand and raises important issues related to current worker health.

Case 1

A 37-year-old man presented to the ophthalmology clinic at Rayong Hospital with injected conjunctiva, lacrimation, irritation and hypersensitivity to light. The subject was a male informal worker who had mixed and sprayed paraquat in a fruit orchard. He had worked from 8:.00 am to 5:.00 pm in the rainy season. The subject had worn casual clothes and masked his face with cotton cloth, without any eye glasses or goggles. The subject did not take a shower or wash his face or limbs immediately after finishing his work. The subject experienced some eye irritation and his condition did not improve for 4 days. On physical examination, his mental status was normal. He had moderated ciliary injected conjunctiva with epiphora. His cornea had no opacity. The visual acuities of the right eye and left eye were 20/40 and 20/40, respectively. There were no skin rashes or lesions. His breathing sounded normal, without any signs of dyspnea. He received artificial tears without preservatives and steroid eye drops. His eye condition was not fully recovered, but was lost to follow-up.

Case 2

A 20-year-old man presented at the ophthalmology clinic at Rayong Hospital with injected conjunctiva, pain and irritation, and greenish discharge. The subject had worked with paraquat without goggles or any protective equipment. He had mild conjunctival ischemia. He received artificial tears without preservatives and steroid eye drops. His eye condition was not fully recovered, but was lost to follow-up.

Discussion and Recommendations

Since the 1950s, the desire to improve the yield of agricultural crops has led to the widespread use of products such as fertilizers, herbicides, fungicides, and insecticides. The clinical observation of short-term and long-term respiratory symptoms in people using or manufacturing these substances has contributed to a growing awareness of the risks associated with the use of these products (13). Occupational exposure studies have revealed a dose-response relationship between paraquat exposure and the risk of chronic cough or dyspnea, breathlessness, and wheezing (14, 15). Many studies of pesticide applicators have revealed impairments in respiratory function, especially with paraquat (16).

In general, informal workers receive less attention compared to workers in the formal sector. Specifically, informal workers lack awareness about the potential health effects of pesticides. Health education programs concerning pesticide hazards, including their short-term and long-term health effects, should be established and delivered to field workers. Furthermore, personal protective equipment is not affordable to workers in developing countries with financial burdens and environmental factors such as high temperatures and humidity. For small businesses in the agricultural sector, a potential solution is for local governments or public hospitals to provide personal protective equipment to workers, especially workers in the agricultural sectors. We also recommend that Thai administrations establish a health

surveillance program that can be effectively implemented to monitor occupational injuries and illness due to pesticide exposure. This report focused on chemical keratoconjunctivitis caused by paraquat exposure. These cases reflect the overall picture of paraquat exposure cases in Thailand, many of which are due to a poor health reporting system. Proper prevention programs, including awareness of adverse health effects caused by paraquat exposure and use of personal protective equipment for workers, are critical.

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