## Letter to the Editor

# Analysis of Paraquat Intoxication Epidemic (2002-2011) within China*

YIN Yu, GUO Xiang, ZHANG Shou Lin, and SUN Cheng Ye#

Paraquat, is a Bipy herbicide have been widely used in last decade in China. Because of its high human toxicity and mortality characteristics, paraquat has been gained considerable attention in recent years. In order to evaluate the epidemic status of paraquat harm to human health in China, 24 h hotline information about paraquat intoxication consultation from January 1st, 2002 to December 31st, 2011 was collected by experienced practitioners in the Poison Control Center (National Poison Control Center, NPCC) of National Institute of Occupational Health and Poison Control of Chinese Center for Disease Control and Prevention, including profession, age, gender, time and dose of paraquat exposed, cause, contact method, time and symptom(s) in the first treatment, treatment procedure, cure situation and current condition.

Each paraquat intoxication case was followed-up once at lease by phone for prognosis information, including recovery status, such as improvement, aggravation, death and hospital transfer. "Improvement" indicates that the illness remits compared with that of last consultation or return visit; "aggravation" refers to the illness worsening in comparison with that of last consultation or return visit; "loss follow up" refers to respondent's refused or wrong phone number; and "unknown" refer to unclear or in determinate outcomes. The last two prognoses become the loss to follow up or unknown in return visits.

Data was analyzed by using SPSS 18.0 for Windows.

From 2002 to 2011, NPCC recorded 1571 cases of paraquat intoxication consultation in total, of which 27.88% (the largest ratio) were occurred in 2010 and 23.62% in 2011. Figure 1A showed that a rising tendency was presented during 2002-2010, with an annual average increasing rate of 47.35%. The most significant increasing rate occurred in 2010, with an increase by 247.62% over 2009 and 194.44% in 2011 as compared with 2009. Figure 1B showed that paraquat intoxication cases occurred all year around,

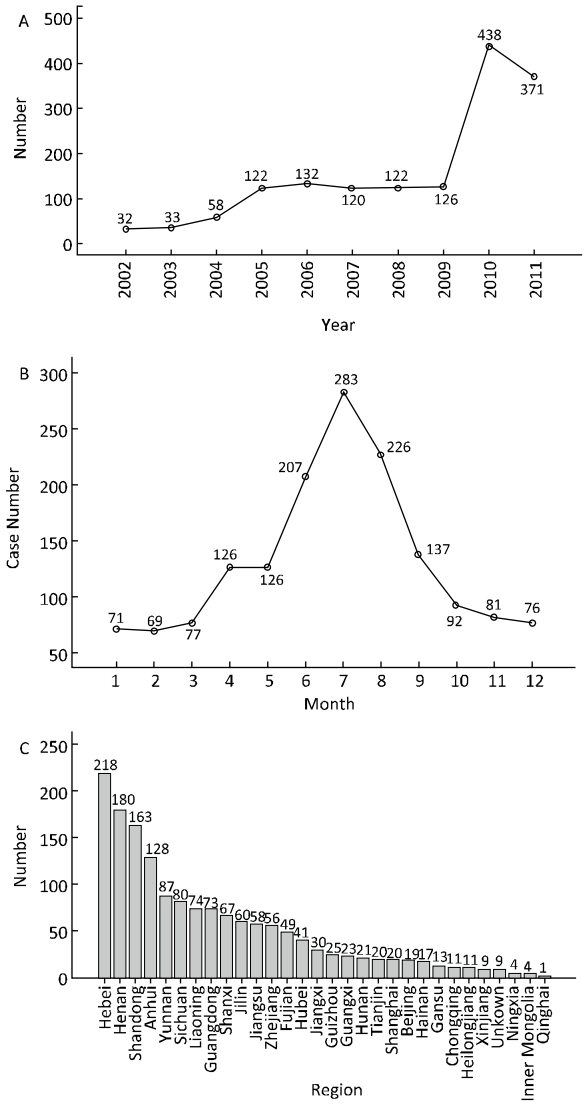


**Figure 1.** A: National paraquat intoxication status (2002-2011); B: Seasonal distribution of national paraquat intoxications (2002-2011). C: Regional distribution of national paraquat intoxications (2002-2011). Note: The "unknown" means that the consultants are unwilling to tell the location.

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National Institute of Occupational Health and Poison Control, Chinese Center for Disease Control and Prevention, Beijing 100050, China

and 45.58% (716/1571) occurred in summer (June, July, and August), 13.75% (216/1571) occurred in winter (December, January, and February). Figure 1C showed that paraquat intoxication cases occurred in 30 provinces, cities and municipalities in China apart from Hong Kong, Macao, Taiwan, and Tibet, of which 49.40% (776/1571) predominantly located in Hebei, Henan, Shandong, Anhui, and Yunnan, 1.15% (18/1571) located in Xinjiang, Qinghai, Ningxia and Inner Mongolia.

Table 1 shows that paraquat intoxication occurred at all age levels, the ratio of male to female was 46.47/49.14, of which 79.89% located at the age level 18-64, and 14.06% occurred at the age under 18. The youngest reported case was an individual aged 10 years old in the self-taking category, where 13.74% were under 18 years old and 83.84% were above 18 years old. Among the accidental ingestion cases, 52 (43.33%) were under 18 years old and 61 (50.83%) were above 18 years old.

Table 2 shows that 73.65% of the total number of intoxication cases resulted in suicide, 13.56% by occupational exposure, and 12.48% by accidental ingestion or accidental expose.

Oral administration (81.29%) was the main contact access to paraquat, In addition, the occupational intoxications were mainly caused by skin and mucosa contact or respiratory tract inhalation.

Table 3 shows that there were total 824 cases of paraquat intoxication being followed from 2008 to 2011, of which 24.03% were death, 21.12% recovered and 28.88% lossed to follow up, and fatality rate was 38.08%. Self-taking was the main cause lead to death.

The data we collected also showed that the maximum doses by self-taking were about 450-500 mL, while 50-60 mL by accidental ingestion, near half of the consultants (40.36%) responded they contact dose of 10-50 mL.

Results in our study showed that paraquat intoxication occurred in China growth rapidly and was widely distributed. Fatality rate remained at a higher level in the most last 10 years, particularly majority located at agricultural provinces. Poisoning cases most occurred via self-administration, followed by accidental consumption involving children, and lastly by occupational exposure without improper protection.

**Table 1.** Causes and Age Distribution of National Paraquat Intoxications (2002-2011)

| Age | *N* (%) | Self-taking | Occupational Contact | Accidental Ingestion | Accidental Contact | Misuse |
|---|---|---|---|---|---|---|
| 0-1 | 4 (0.25) | 0 | 0 | 4 | 0 | 0 |
| 1-14 | 97 (6.17) | 48 | 0 | 40 | 9 | 0 |
| 14-18 | 120 (7.64) | 111 | 1 | 8 | 0 | 0 |
| 18-64 | 1255 (79.89) | 935 | 201 | 54 | 60 | 5 |
| 64- | 49 (3.12) | 35 | 7 | 7 | 0 | 0 |
| Unknown | 46 (2.93) | 28 | 4 | 7 | 7 | 0 |
| Total | 1571 (100.00) | 1157 | 213 | 120 | 76 | 5 |

**Table 2.** Causes and Contact Access of National Paraquat Intoxications (2002-2011)

| Causes | Number | Oral Administration | Percutaneous & Mucosa Contact | Respiratory Tract Inhalation |
|---|---|---|---|---|
| | Total (%) | *N* (%) | *N* (%) | *N* (%) |
| Self-taking | 1157 (73.65) | 1157 (90.60) | 0 (0.00) | 0 (0.00) |
| Occupational Contact | 213 (13.56) | 0 (0.000) | 164 (68.05) | 49 (92.45) |
| Accidental Ingestion | 120 (7.640) | 120 (9.40) | 0 (0.00) | 0 (0.00) |
| Accidental Contact | 76 (4.84) | 0 (0.000) | 72 (29.88) | 4 (7.55) |
| Misuse | 5 (0.32) | 0 (0.000) | 5 (2.07) | 0 (0.00) |
| Total | 1571 (100.00) | 1277 (100.00) | 241 (100.000) | 53 (100.00) |
| Ratio (%) | / | 81.29 | 15.34 | 3.37 |