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Attitudes and knowledge about naloxone and overdose prevention among detained drug users in Ningbo, China

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Abstract

Background: To date there has been limited research on both the prevalence of overdose and drug user knowledge about overdose prevention and response methods in China. In addition, there has been no effort to integrate naloxone information and distribution into pre-release services for drug users detained in isolated compulsory detoxification facilities in China.

Methods: The authors conducted a survey of 279 heroin users in isolated compulsory detoxification centers in Ningbo, China in an attempt to evaluate the possibility of conducting pre-release peer naloxone programs in Ningbo isolated compulsory detoxification centers. Respondents' demographic background, history of heroin overdoses, and attitudes/knowledge about overdose prevention and response were collected.

Results: While drug users in Ningbo's compulsory detoxification centers have limited understandings of how to effectively respond to overdoses, they expressed concern about the possibility of overdose, interest in participating in overdose prevention and response programs, and a willingness to help their peers. In general, there was no significant difference in history and attitudes/knowledge of overdose between male and female participants.

Conclusion: Based on the findings of this research, our survey provides preliminary evidence that detained drug users have considerable interest in overdose prevention and response information and willingness to help peers. However, drug users in Ningbo isolated compulsory detoxification centers currently have limited understandings of effective ways of helping to prevent overdose deaths.

Keywords: Overdose prevention, Opiate addiction, Naloxone, Peer education compulsory detoxification centers

Background

Overdose is a leading cause of death among illegal opiate users world-wide and has been increasing over the last two decades [1-5]. Drug overdose is also a common cause of non-AIDS death among people with HIV [6]. Naloxone is an opiate antagonist with the property of pharmacologically reversing heroin and other opiate overdoses if administered in a timely manner. The medication has been used for decades by medical professionals [7,8]. Since the mid-1990s, it has also been distributed to drug using peers and other non-medical

personnel in an attempt to reduce overdose-related deaths in the community [9,10].

Today, there are hundreds of programs distributing naloxone in over 10 countries around the world [8,11-16]. Evaluations from a number of pilot studies have shown that drug-using peers are capable of effectively administering naloxone and saving lives [17-21].

Since the late 1980s, illicit drug use and trafficking has been a growing problem in China. The number of registered illicit drug users, mainly heroin users, has increased from 70,000 in 1990 to 1,336,000 in 2009 [22]. Although heroin overdose-related deaths have been reported anecdotally, systematic collection of overdose data in China is still rare in the literature [23]. In a cohort study which enrolled 731 heroin users in Liangshan, Sichuan, China, authors reported a 12% rate of 1-

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year prevalence of nonfatal overdose and calculated a heroin overdose death rate of 4.7 per 100 persons [24,25]. Heroin overdoses accounted for 68% (30/44) of all deaths reported during the 3-year cohort study [26].

More than half of the registered heroin users reported intravenous injection as their primary mode of heroin administration in China [27]. A number of organizations in China have attempted to integrate overdose prevention and response interventions into harm reduction programming. Daytop, Population Services International (PSI) and various Centers for Disease Control programs in the past several years have offered overdose prevention information in trainings in community peer education programs and in compulsory detoxification-based trainings in Yunnan province. Naloxone has also been widely available in hospitals and emergency ambulances in China and the national methadone maintenance program requests each of the country's over 600 methadone clinics keep the medication on-hand. The first community-based peer administration of naloxone started on a small scale in two sites in 2008. In early 2011, harm reduction programs begun to pilot various models for distributing naloxone in twenty cities in China as part of more robust overdose prevention and response programs [23].

Most of China's isolated compulsory detoxification centers, which housed an estimated 170,000 drug users in 2009, have not integrated overdose response training or naloxone distribution into pre-release programs [28]. To date, there are no published studies examining the knowledge and attitudes of detained drug users towards overdose prevention and response despite the fact that relapse among those released from these facilities is extremely high [29,30]. The present study was conducted to provide evidence about opiate overdose and prevention knowledge among a population of heroin users in Ningbo isolated compulsory detoxification centers.

Methods

Participants

In total, 298 patients with a self-reported history of heroin use and a positive opioid urine test prior to entry into the compulsory detoxification center were offered to participate in the study. Research staff ensured that participants understood the decision to participate was voluntary and refusal would not have negative repercussions. A total of 279 patients agreed to complete the study. Before the survey was administered, eligible participants received consent forms distributed by research staff. Anonymity in the data collection process was ensured by not soliciting names or other identifying details on the questionnaire. In addition, after explaining and handing out the survey, researchers and staff

members left the room while participants filled out the survey. The participants were asked not to discuss the questionnaires with each other. The study was approved by the Institutional Review Board of the Ningbo Addiction Research and Treatment Center.

Questionnaire

A brief self-administered, written survey was carried out at the Ningbo Compulsory Detoxification Center in Zhejiang Province. The survey contained 22 questions and required approximately 20 min for participants to fill out. Before the study began, the survey instrument was piloted with 12 methadone clients and subsequently revised to ensure questions were asked in a clear and straightforward manner. Basic demographic information, including gender, age, ethnicity, education, and marital status, was collected. The survey also asked specific questions relating to respondents' heroin use history and experiences of witnessing fatal and non-fatal overdoses. In addition, the survey assessed the respondents' knowledge about heroin overdose, including asking whether respondents believed a range of methods for reversing an overdose were effective. Finally, participants were asked questions about their own likelihood to participate in future efforts to reduce overdoses, including potential interest in attending overdose prevention trainings, as well as willingness to share information and administer naloxone to their peers. Research staff explained to study participants that the definition of an overdose was shallow or no breathing, "pinpoint pupils" or tongue discoloration. Since we were concerned about the educational level of the participants, a simple definition of heroin overdose was used in the present study.

Data analysis

Demographic and attitude variables were analyzed with descriptive statistics. Pearson χ^2 or Fisher's exact test was used to examine the differences of history and attitudes/knowledge of overdose between male and female participants when necessary. All tests were two-sided and *p*-value less than 0.05 were considered statistically significant. All statistical analyses were performed using SPSS 10.

Results

Demographic information

Participants' demographic information and heroin use history are summarized in Table 1.

History of overdose

History of overdose is summarized in Table 2. In total, 104 (37.3%) of the respondents reported having accidentally overdosed in the past. Of this group, 75 respondents (72.7%) reported that at least one other person

Table 1 Basic demographic characteristics surveyed patients

	Total	Male	Female
Number of participants	279	191 (70.0%)	82 (30%)
Age (Mean ± STD)	31.7 ± 7.1	31.3 ± 7.5	32.3 ± 6.2
Ethnicity			
Han	248 (91.9%)	172 (90.5%)	76 (95.0%)
Minority	22 (8.1%)	18 (9.5%)	4 (5.0%)
Marital Status			
Single	130 (48.9%)	92 (49.7%)	38 (46.9%)
Married	92 (34.6%)	71 (38.4%)	21 (25.9%)
Divorced	36 (13.5%)	17 (9.2%)	19 (23.5%)
Separation	2 (0.8%)	2 (1.1%)	0
Widowed	6 (2.3%)	3 (1.6%)	3 (3.7%)
Education			
Illiterate	15 (5.7%)	12 (6.5%)	3 (3.7%)
Elementary school	72 (27.2%)	53 (28.9%)	19 (23.5%)
High or vocational school	124 (46.8%)	80 (43.5%)	44 (54.3%)
College	49 (18.5%)	36 (19.6%)	13 (16.0%)
Graduate school	5 (1.9%)	3 (1.6%)	2 (2.5%)
Route of heroin administration			
Snorting	13 (5.4%)	8 (4.7%)	5 (7.2%)
Smoking	140 (58.3%)	107 (62.9%)	33 (47.8%)
Injecting	55 (22.9%)	34 (20.0%)	20 (29.0%)
2 or 3 methods	32 (13.3%)	21 (12.4%)	11 (15.9%)
Duration of heroin use (years)	4.82 ± 4.18	4.28 ± 3.67	6.22 ± 5.03

was around them the last time they overdosed. Less than half (39.0%) of respondents reported that someone they knew had died of an overdose. Significantly more female participants reported that someone they knew had died of an overdose than male participants ($p < 0.05$). Of this group of 105 respondents, 18.1% reported having one acquaintance die in the past year, 10.5% reported between two and four, and 2.9% reported having more than ten die within the last year. Of the 37.4% of survey subjects who reported witnessing an overdose, 17.0% reported witnessing one, 9.6% had seen between two and four, 2.1% had seen between five and ten, and 1.1% had witnessed more than ten within the past 12 months. The other person present at this last overdose was most likely a friend who was also using drugs (70.1%). However, family members (17.9%), non-drug using friends (7.5%) and “others” (4.5%) were also reported present at overdoses. The majority of respondents (65.9%) reported that they were concerned about overdosing in the future. However, only 37.2% indicated that they had discussed the topic of overdose prevention and response with their families or friends.

Table 2 History of overdose

	Total	Male	Female
Experiencing heroin overdose	37.3%	32.1%	48.0%
Witnessing heroin-overdose	37.4%	35.6%	41.3%
Past 12 month, none	68.1%	66.7%	70.6%
Past 12 months, 1	17.0%	15.0%	20.6%
Past 12 months, 2-4	9.6%	13.3%	2.9%
Past 12 months, 5-10	2.1%	0	0
Past 12 months, > 10	1.1	1.7%	5.9%
Knowing someone who died of heroin overdose	39.0%	34.4%	49.4%*
Past 12 months, none	71.2%	73.2%	67.5%
Past 12 months, 1	17.1%	19.7%	12.5%
Past 12 months, 2-4	9.0%	7.0%	12.5%
Past 12 months, 5-10	0	0	0
Past 12 months, > 10	2.7%	0	2.7%
The other person present at this last overdose			
Family member	17.9%	16.7%	20.0%
Drug using friends	70.1%	73.8%	64.0%
Non-drug users	7.5%	7.1%	8.0%
Others	4.5%	2.4%	8.0%
Concerned about overdose	65.9%	68.3%	60.5%
Discussing overdose with others	37.2%	33.3%	44.9%

* $p < 0.05$ a significant difference between male and female participants

** $p < 0.01$ a significant difference between male and female participants

Knowledge related to overdose prevention and response

Knowledge related to overdose prevention and response is summarized in Table 3. When asked to choose from a list multiple appropriate ways of responding to a victim of overdose, the most popular answer was “injecting salt water” (56.0%), followed by “calling 120” (emergency) (34.1%), and “pinching an acupuncture point” (21.7%). Only 12.7% of participants selected mouth to mouth resuscitation and 6.0% listed administering naloxone as an appropriate response to an overdose. Significance was found between male and female participants in the following item as a measure to prevent overdose: waking her/him up ($p < 0.01$), pinching an acupuncture point ($p < 0.01$), injecting salt water ($p < 0.01$), drinking water ($p < 0.05$), naloxone ($p < 0.05$), and mouth to mouth resuscitation ($p < 0.05$).

When a follow-up question asked explicitly whether injecting salt water was an effective response to opiate overdose, 63.4% responded that it was effective, 8.8% said it was not effective, and 27.8% reported that they did not know. When asked the same question about naloxone, 28.2% said administering the drug was an effective way to respond to an overdose, 8.8% said it was ineffective, and 63.7% responded that they did not know. Significantly more male users considered naloxone as an

Table 3 Knowledge of overdose

	Total	Male	Female
Signs of heroin overdose			
Breathing ↑	15.8%	15.4%	16.7%
Breathing ↓	26.1%	26.5%	25.0%
Pulse ↑	20.9%	20.4%	22.2%
Pulse ↓	25.2%	24.1%	27.8%
Pupils ↑	23.5%	17.9%	36.1%
Pupils ↓	10.7%	11.7%	8.3%
Body temperature ↑	8.1%	6.2%	12.5%
Body temperature ↓	6.8%	4.9%	11.1%
Loss of consciousness	51.3%	43.8%	68.1%
Excited	7.3%	7.4%	6.9%
Don't know	9.4%	11.1%	5.5%
Responding to a victim of overdose			
Waking him/her up	22.6%	13.1%	44.2%**
Pinching an acupuncture point	21.7%	25.1%	46.8%**
Cold water	7.7%	5.7%	10.4%
Injecting salt water	56.0%	47.4%	75.3%**
Calling 120 (emergency)	34.1%	34.9%	32.5%
Drinking water	3.2%	2.3%	5.2%*
Naloxone	6.0%	7.4%	2.6%
Mouth to mouth resuscitation	12.7%	9.7%	32.5%*
Waking up on his/her own	2.0%	2.3%	1.3%
Don't know	3.6%	4.0%	2.6%
Injecting salt water is effective to prevent overdose			
Yes	63.4%	60.7%	69.7%
No	8.8%	10.4%	5.3%
Don't know	27.8%	28.9%	25.0%
Naloxone is effective to prevent overdose			
Yes	28.2%	32.2%	19.5%*
No	8.1%	7.6%	9.1%
Don't know	63.7%	60.2%	71.4%
Having learned cardiopulmonary resuscitation techniques			
Yes	17.6%	19.6%	12.9%
No	82.4%	80.4%	87.1%
Causes of overdose			
After drinking heavily	21.9%	19.0%	27.8%
Poly-drug use	14.6%	12.5%	19.0%
Abstinence	26.7%	17.3%	46.8%**
Good quality of heroin	76.1%	73.8%	81.0%
Unknown substance in heroin	18.2%	14.3%	26.6%*
Don't know	4.5%	5.4%	2.5%
How did participants obtain information about heroin overdose?			
Friends	63.1%	56.1%	78.2%**
Brochures	23.7%	22.8%	25.6%
Media	24.5%	28.1%	16.7%
Training programs	3.6%	5.3%	0
Don't know	4.8%	5.8%	2.6%*

* $p < 0.05$ a significant difference between male and female participants

** $p < 0.01$ a significant difference between male and female participants

effective approach to prevent overdose, compared with female ones ($p < 0.05$).

The vast majority (82.4%) reported they had not learned cardiopulmonary resuscitation techniques in the past. Significance was found between male and female participants in the following item, abstinence as the cause of overdose and “don’t know” how to obtain overdose information. More specifically, significantly more female drug users reported abstinence ($p < 0.01$) and unknown substance in heroin as the cause of overdose ($p < 0.05$), compared with male ones. Also, significantly more female users obtained information heroin overdose from friends, relative to male participants ($p < 0.01$).

Needs relating to overdose prevention and response

When asked whether or not they would be interested in attending trainings on overdose prevention and response if they were offered, 64.0% of participants reported they would be interested. In total, 88.1% of participants reported that they would be willing to administer a medication to an acquaintance having an overdose. Finally, the great majority (69.2%) of respondents reported they would be willing to pass on overdose-related information to their peers.

Discussion

Research in other countries has shown that individuals recently released from prisons who use opiates are at elevated risk to experience fatal and non-fatal heroin overdoses compared with active opiate users [31-35]. The WHO has recommended that pre-release overdose prevention, including the use of naloxone for those released drug users and others in their social networks [36].

Results from this survey support the idea that overdose prevention training, including naloxone distribution, is needed and wanted in the region. A high percentage of surveyed heroin users lack accurate information related to overdose response. In particular, participants choose “injecting salt water”, a strategy that has been proven to be ineffective [37], as an effective way to respond to an overdose at a rate more than one and a half times higher than calling 120 (emergency), five times higher than the rate of performing mouth to mouth resuscitation, and nine times higher than administering naloxone. That accurate information about overdose response is lacking among many heroin users in Ningbo is not surprising given that to date there have been no peer-focused harm reduction activities, including overdose prevention intervention, in the region.

The survey data also shows that there is an interest in overdose prevention and response interventions among detained drug users. Between 64% and 88% of participants in the survey indicated that overdose was a concern in their own lives and, that they would be willing

to attend a training program on overdose prevention, help peers administer naloxone, and share information they learned about these services. This finding mirrors international studies that have found that most drug users are willing to help peers [38,39].

Approximately a third of Ningbo respondents reported having accidentally overdosed in the past, 37.7% witnessed an overdose, and close to 40% reported having someone who they knew die of an overdose. These numbers are lower than drug user reports of witnessing an overdose in San Francisco (89%) [40], sixteen cities throughout Russian federation (81%) [5], and London (81%) [41]. In Gejiu, China, approximately 90% of drug users surveyed had witnessed overdoses (unpublished data, author communication). In Kunming, China, 34% of respondents recruited from a methadone maintain clinic recently reported being at the site of an overdose of an acquaintance within the last year, nearly three times the number of our Ningbo participants (11.9%) (personal communication, unpublished data). There are a number of factors that may account for the relatively lower occurrence of overdose in Ningbo, such as lower proportion of opiate users injecting (less than 37% of those surveyed indicated that they injected), less mixing of drugs, and relatively low purity of heroin in the region. This underscores the fact that while there is a definite need for overdose prevention and response in Ningbo, there may be even greater need in other parts of the country, where a variety of factors may result in higher number of overdoses.

There are several limitations of this study’s methodology that need to be addressed here. Generalization of these results must be made with caution as Ningbo’s heroin using population and drug treatment services may not be representative of compulsory detoxification centers in other parts of the country. In addition, the study did not attempt to collect more details of participants’ drug use history, information about poly-drug use, or other risk factors that could better identify the specific risk factors associated with overdose among this population. Furthermore, a simple and broad definition of heroin overdose was used in the questionnaire, due to the educational level of the participants. It is possible that this definition of overdose might bias the prevalence estimated here. In the future, more detailed research is needed to better understand what are the risk factors associated with heroin overdoses in Ningbo, where overdose deaths are occurring, and which demographics of heroin users are currently at highest risk. Future studies should recruit in multiple settings to attempt to recruit a more representative sample of those at risk of overdosing.

Despite these limitations, our survey provides preliminary evidence that detained drug users in Ningbo have

considerable interest in overdose prevention and response information and willingness to help peers. However, detained drug users in Ningbo isolated compulsory detoxification centers currently have limited understandings of effective ways of helping to prevent overdose deaths. According to the recent China Drug Control Law, drug dependent patients are required to receive isolated compulsory detoxification for between one and 3 years [42]. Our study indicates that survey respondents had rather limited amount of overdose prevention related information. It should also be noted that relapse rates among individuals released from the isolated compulsory detoxification centers have been found to be extremely high [29,30]. Taken together, we believe that Ningbo isolated compulsory detoxification centers could adopt an overdose prevention and response curriculum in compulsory detoxification centers, including pre-release coordination of pre-release distribution of naloxone.

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Authors' contributions

YL, LL and WZ designed the study. YL, LL, YZ carried out the study. LL and XL conducted the statistical analysis. YL, NB, and WZ wrote the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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