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Impact of UNODC/WHO S-O-S (stop-overdose-safely) training on opioid overdose knowledge and attitudes among people at high or low risk of opioid overdose in Kazakhstan, Kyrgyzstan, Tajikistan and Ukraine

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Abstract

Introduction Opioid overdose education and naloxone distribution (OEND) is an evidence-based strategy to reduce opioid overdose deaths in line with guidance provided by the World Health Organization (WHO) and United Nations Office on Drugs and Crime (UNODC). However, OEND effectiveness has rarely been examined in low- and middle-income countries (LMICs). The WHO/UNODC Stop Overdose Safely (S-O-S) project involved training of > 14,000 potential opioid overdose witnesses in opioid overdose response (including the administration of naloxone) in Kazakhstan, Kyrgyzstan, Tajikistan and Ukraine. We examined the impact of training using the S-O-S training package, developed within the framework of the S-O-S project, on knowledge of and attitudes towards, opioid overdose as well as effective opioid overdose response amongst participants stratified by high and low personal risk of opioid overdose.

Design and methods A sample of S-O-S project participants were recruited into a cohort study to evaluate the effects of training using the S-O-S training package. Of these participants, 1481 at high or low personal risk of opioid overdose completed pre- and post-S-O-S training questionnaires that incorporated sections of the Brief Opioid Overdose Knowledge (BOOK) and Opioid Overdose Attitudes Scale (OOAS) instruments. Outcomes examined included overall scale scores as well as scores on instrument sub-scales. Mean change scores, stratified by personal

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risk of opioid overdose, were calculated and compared using repeated measures t-tests. Variation in overall change scores according to select participant characteristics (e.g., age, sex) was also examined using multivariable linear regression.

Results After training there were increases in overall BOOK and OOAS mean scores with a similar pattern evident in mean scores for all instrument subscales. Observed changes were larger for participants at low personal risk of opioid overdose (between 11% and 112%, depending on measure) compared to those who were at high personal risk of overdose (between 5% and 33% depending on measure), reflecting higher baseline scores for those at high personal risk of opioid overdose. We observed few variations in change scores across other participant characteristics. However, amongst those at high personal risk of opioid overdose, no personal experience of an overdose (β=-0.3; 95%CI=-0.5-0) and not currently being in drug treatment (β=-0.6; 95%CI=-0.4-0.8) was associated with a higher BOOK change score. Reporting not having witnessed an overdose previously was associated with higher BOOK change scores amongst those at low personal opioid overdose risk (β = 0.5; 95%CI = 0.2–0.8). Not currently being in drug treatment (β=-1.3; 95%CI=-0.1-2.4) was associated with a higher OOAS change score amongst those at high personal risk of opioid overdose.

Discussion OEND training using the S-O-S training package resulted in substantial improvements in knowledge and attitudes related to opioid overdose and responses in the four countries, with improvements most notable amongst those at lower personal risk of opioid overdose. Widespread implementation of OEND using the S-O-S training package or similar could improve opioid overdose response in LMICs.

Introduction

Naloxone is an opioid antagonist widely used to reverse opioid overdoses [1]. Opioid overdose prevention programs involving the community distribution of naloxone (hereafter overdose education and naloxone distribution, OEND) have been implemented in many high-income countries [2, 3]. OEND programs typically involve training people who are likely to witness an opioid overdose in the identification of opioid overdose and how to respond appropriately, including the administration of naloxone. Many evaluations of these training programs in high income countries show that they are effective in improving opioid overdose knowledge and response [2, 4, 5]. and reducing opioid overdose mortality [6–8]. Consistent with these findings, the United Nations Office on Drugs and Crime (UNODC) and the World Health Organization (WHO) supports OEND with the need for scaling up widely recognized in high level international policy documents, including in the outcome document of the United Nations General Assembly Special Session (UNGASS) on the world drug problem in 2016 and resolution 55/7 of the Commission on Narcotic Drugs [9].

Reviews show that the vast majority of OEND research has been conducted in high income countries [3]. The few studies conducted in low- and middle-income countries (LMICs) have focused on outcome measures related to naloxone administration rather than the effectiveness of training measures and materials. Studies in high-income countries have examined these outcomes but have also considered the effectiveness of OEND training itself, particularly in relation to its impact on knowledge of opioid overdose and appropriate responses as well as attitudes towards opioid overdose response [e.g., 4]. In general, OEND training has been shown to increase knowledge of overdose recognition and appropriate response and improve attitudes towards overdose response [2, 4, 5]. The training provided in these programs, as well as the instruments used to measure program effects, varies widely across studies ranging from brief interventions [e.g., 10], through to intense education sessions lasting > 1 h [11]. Unfortunately, many studies do not include a comprehensive description of the training provided.

We recently conducted an implementation and feasibility study of the Stop Overdose Safely (S-O-S) opioid overdose prevention and response program in Kazakhstan, Kyrgyzstan, Tajikistan and Ukraine, as part of the wider S-O-S initiative [12–14]. Previously, we have detailed how the four countries differ in terms of key factors related to opioid overdose and response such as opioid agonist treatment coverage, naloxone availability and legal protections for responders making them ideal locations for S-O-S implementation [12]. Partners in the four countries implemented the S-O-S training program and provided naloxone to more than 14,000 program participants across the four countries. The implementation was coordinated by the WHO and the UNODC. In a previous article we detailed findings from a prospective cohort study of a sample of program participants showing that naloxone was used by just under 90% of program participants at recently witnessed opioid overdoses in the six months prior to follow up, in accordance with study targets [12]. Importantly, these effects were seen across the entire sample, including people who inject drugs (a key group at risk of opioid overdose [15]) and those who did not report injecting drugs (who we assumed to be at less risk of overdose) but nonetheless may witness

opioid overdoses (e.g., family members, harm reduction workers). However, we did not report on the effects of the S-O-S training on participant knowledge, recognition, response and attitudes towards opioid overdose and response. In this paper we detail the effects of the S-O-S training on measures of opioid overdose knowledge and attitudes amongst the S-O-S cohort study members immediately before and after they received training. We expected that potential opioid overdose witnesses trained using S-O-S materials would demonstrate improved knowledge of opioid overdose and response and improved attitudes towards overdose response, across participants who are at high personal risk of opioid overdose and those who are at low personal risk of opioid overdose.

Methodology

Design and procedure

We have previously reported on our prospective observational cohort study that was conducted as part of the S-O-S project in Kazakhstan, Kyrgyzstan, Tajikistan and Ukraine [12]. Briefly, a convenience sample of S-O-S project participants was recruited by word of mouth by trained research staff at NGOs providing a range of harm reduction services (e.g., needle and syringe programs, opioid agonist therapy) in the capital cities of the four countries. In Kyrgyzstan participants were also recruited from services in three small towns near the capital Bishkek and in Tajikistan participants were also recruited from Khorog, a town near the Afghan border. This sample was interviewed before and after S-O-S project training and again six months post-training. During interviews, participants were administered a structured questionnaire that canvassed a range of domains including participant demographics, drug use history, opioid overdose knowledge measured through the Brief Opioid Overdose Knowledge (BOOK) scale [16], and attitudes and willingness to respond to opioid overdoses, measured through a modified version of the Opioid Overdose Attitudes Scale (OOAS) [17]. For this study we examined whether the BOOK and OOAS scale scores improved after S-O-S overdose management training by comparing scores collected immediately before and after training. Participants were offered the local currency equivalent of 3–8USD, dependent on country, as reimbursement for the time and out-of-pocket expense associated with their participation. Further details of the study design and procedures, including ethical approvals that were obtained for the overall study and within individual countries, can be found elsewhere [12–14].

The S-O-S training package

The S-O-S training package tested in this study was informed by available materials in study countries, by consultations undertaken by the WHO, UNODC as well as other external sources, including the Scottish National Naloxone Programme and Scottish Drugs Forum. The training package was piloted in country prior to its implementation and covered the following topics: (1) risk factors for opioid overdose (e.g., loss of tolerance, mixing psychoactive substances, using alone), (2) signs of overdose (e.g., lack of response to sternal rub, shallow or no breathing, and blue-ish, paler lips and fingernail beds), and (3) how to respond to an overdose (e.g., call ambulance, provide rescue breathing, use naloxone). A One-to-One Naloxone Training Checklist was developed to guide the intervention delivery. Training was delivered in-person, typically in groups but also on a one-to-one basis. Further details are available in the S-O-S report [14], and the training package itself will be published shortly on the UNODC website.

Participants

The overall cohort study sample included 1646 participants from the four S-O-S countries. For the purposes of the current study, we stratified participants according to whether they were at high personal risk of opioid overdose and those at low personal risk of opioid overdose. A history of injecting drug use was used as a marker of high personal risk of opioid overdose as it is known that injecting is a major risk factor for opioid overdose [18], with local information suggesting the vast majority of opioid overdoses occur after consumption by injecting. Within the low personal risk of opioid overdose group, we only included those without demonstrated markers of heavy drug consumption (screening positive to severe level drug problems on the DAST 10 [19], reporting having experienced overdose and/or reporting currently being in treatment) in an attempt to clearly differentiate this group from those most at personal risk of overdose. Participants who gave contradictory responses (e.g., reported no drug use but reported injecting drugs) or who had missing outcome or exposure data were excluded. Figure 1 shows that the final sample of 1481 participants 89.9% of the total sample) included 1018 people who were classified as being at high personal risk of opioid overdose and 463 people who were classified as being at low risk of opioid overdose, representing 68.7% and 31.3% of the final sample respectively.

Measures

Outcome measures Outcome measures were derived from the BOOK and OOAS scales as implemented in the study. BOOK subscales include Opioid Knowledge (items 1–4), Opioid Overdose Knowledge (items 5–8), and Opioid Overdose Response (items 9–12). OOAS subscales are Competence (items 1–3, 11, 12, 14, 20, 21, 24, 26),

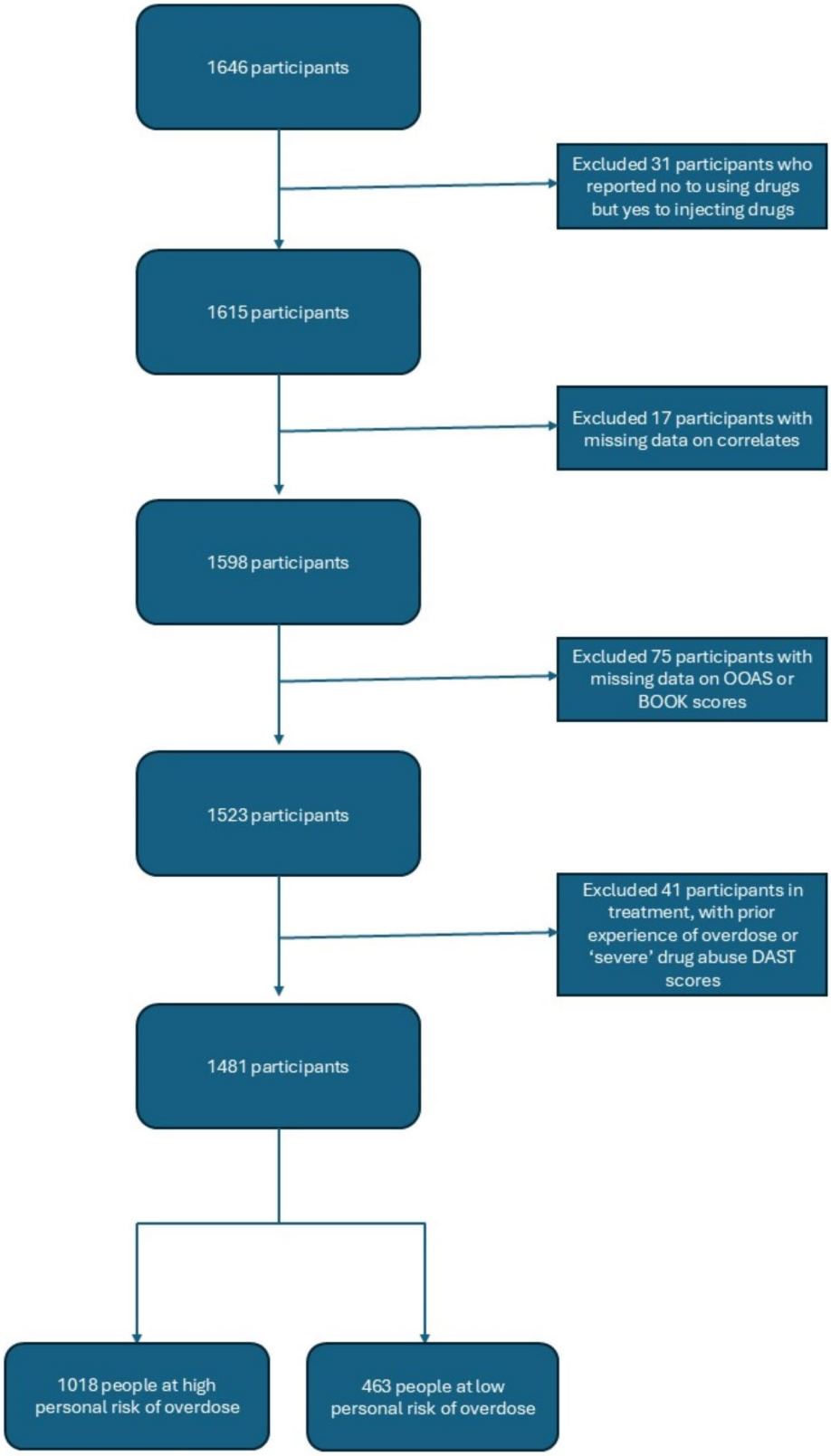

Fig. 1 Participant inclusion

Concerns (items 4, 6, 7, 15, 16, 18, 23, 25), and Readiness (items 5, 8–10, 13, 17, 19, 22, 27).

Potential correlates Sex (male, female), age (< 25, 25–29, 30–39, 40–49, 50+) and history of witnessing an overdose (yes, no) were included as potential correlates for analyses across both participant groups. For the analysis of the sample of people with a history of injecting drug use we also included DAST 10 score [19] (dichotomized as no-substantial level problems [0–8], severe level problems [9–10]), current drug treatment (any type, including opioid agonist therapy - yes, no), history of personally experiencing an overdose (yes, no).

Statistical analyses

All analyses were conducted using Stata version 16.1 and stratified by personal risk of overdose. Basic demographic and drug use variables were generated and χ2 tests used to compare sample characteristics. Change scores were calculated as the difference between pre- and post-intervention scores for the BOOK and OOAS scales. Overall and subscale mean change scores were generated and one-sample t-tests were used to test whether a statistically significant change was detected. We then ran a series of multivariable linear regression analyses to examine the relationship between the selected demographic and drug use characteristics and the overall BOOK and OOAS change scores, after adjusting for baseline score. A complete case approach was taken whereby any case missing on any of the exposure variables considered was excluded from analyses (see Fig. 1).

Results

Baseline sample characteristics

Table 1 shows the main baseline characteristics of the analytic samples. Around 80% of the sample categorized as being at high personal risk of opioid overdose were male, while the sex distribution of the sample at low risk was more evenly balanced. Most participants were aged over 30 years (89.9%). Nearly half the sample at high personal risk of opioid overdose was 30–39 years, while those at low risk appeared more evenly dispersed across ages. Most of the sample reported witnessing an overdose previously but this was more frequently reported by those at high personal risk of opioid overdose, almost three quarters of whom reported that they had experienced an overdose themselves. The majority of those at high personal risk of opioid overdose were classified as experiencing severe problems using the DAST-10 and a substantial minority of this group reported being in drug treatment.

Table 1 Age and sex distributions of the analytic sample and selected drug use characteristics, overdose risk category

	High risk of opioid overdose		Low risk of opioid overdose		
Sex	***N***	**%**	***N***	**%**	**(χ2)*p***
Male	834	81.9	245	52.9	< 0.001
Female	184	18.1	218	47.1	
Age					
< 25 years	8	0.8	26	5.6	< 0.001
25–29 years	60	5.9	56	12.1	
30–39 years	469	46.1	162	34.9	
40–49 years	365	35.9	137	29.6	
> 50 years	116	11.4	82	17.7	
Employment					
Working full-time	194	19.1	249	53.8	< 0.001
Part-time	314	30.8	109	23.5	
Unemployed	317	31.1	35	7.6	
Other	193	19.0	70	15.1	
DAST-10					
No-substantial level problems	410	40.3	-	-	
Severe level problems	608	59.7	-	-	
Current drug treatment					
Yes	386	37.9	-	-	
No	632	62.1	-	-	
Ever overdosed					
Yes	747	73.4	-	-	
No	271	26.6	-	-	
Ever witnessed an overdose					
Yes	960	94.3	297	64.2	< 0.001
No	58	5.7	166	35.9	

Impacts of S-O-S project training on opioid overdose knowledge

BOOK scores (range = 0–12) obtained at baseline and mean change scores are presented in Table 2 by overdose risk category. Baseline scores for participants at high personal risk of opioid overdose were high but nevertheless showed a statistically significant improvement of 24% after training for overall scores and ranging between 12% and 33% across subscales. Despite a lower mean baseline score, a similar pattern was observed in the scores of those at low personal risk of opioid overdose, but the magnitude of improvement was larger, 85% for overall scores and ranging between 56% and 112% across subscales.

Impacts of S-O-S project training on opioid overdose attitudes

OOAS scores (range = 0-140) obtained at baseline and mean change scores are also presented in Table 2 by overdose risk category. Baseline scores for participants at high personal risk of opioid overdose were high and showed a statistically significant improvement of 11% after training for overall scores and ranging between 5% and 16% across subscales. A similar pattern was observed in the scores of those at low personal risk of opioid overdose, but the magnitude of improvement was larger, 21% for overall scores and ranging between 11% and 33% across subscales.

Variations in training impacts by key participant characteristics

Table 3 shows the distribution of BOOK and OOAS scores across selected participant characteristics within both overdose risk groups, along with the results of multivariable regression analyses including these variables. There were few statistically significant variations in scores across age and sex groups and those that were evident were small. However, amongst those at high personal risk of opioid overdose, no personal experience of an overdose (β=-0.3; 95%CI=-0.5-0) and not currently being in drug treatment (β=-0.6; 95%CI=-0.4-0.8) were associated with a higher BOOK change score. Reporting not having witnessed an overdose previously was associated with higher BOOK change scores amongst those at low personal risk of opioid overdose (β = 0.5; 95%CI = 0.2–0.8). Not currently being in drug treatment (β=-1.3; 95%CI=-0.1-2.4) was associated with a higher OOAS change score amongst those at high personal risk of opioid overdose.

Discussion

Overall, our study suggests that the S-O-S OEND training package can effectively improve knowledge of opioid overdose and appropriate response and opioid overdose attitudes, for people at high personal risk of opioid overdose and for people at low risk of opioid overdose. Improvement was found across all subscales of the instruments used. Our findings demonstrate that the positive effects of OEND training noted in high income countries [2, 4], can also be produced using the S-O-S training package in LMICs in Central Asia and Europe. When coupled with the evidence of the effectiveness of the program in achieving targeted aims [12] and empowering program participants [13], our findings suggest that the S-O-S program is an effective mechanism for responding to opioid overdose in LMICs.

There were few variations across participant characteristics evident in the training effects we observed in either overdose risk group. The increases observed in the instruments we used were greater for those classified as being at low personal risk of opioid overdose, possibly reflecting lower starting points in terms of opioid overdose knowledge and attitudes. Nevertheless, the changes observed in the sample who were classified as being at high personal risk of opioid overdose were substantial (e.g., a 22% increase in overdose response knowledge) and highlight that training can benefit even those who already have a large knowledge base around drug use and

Table 2 BOOK and OOAS overall and subscale pre-post change scores, by overdose risk category

	High risk of opioid overdose				Low risk of opioid overdose			
	Baseline		Change score		Baseline		Change score	
BOOK	**mean**	**SD**	**mean**	**SD**	**mean**	**SD**	**mean**	**SD**
Total	8.6	2.5	2.1*	2.6	6.0	3.9	5.1*	4.1
Opioid knowledge	3.3	0.9	0.4*	0.9	2.3	1.4	1.3*	1.5
Overdose knowledge	2.5	1.2	0.7*	1.3	1.7	1.6	1.9*	1.7
Overdose response	2.7	1.2	0.9*	1.3	1.9	1.6	1.9*	1.7
OOAS								
Total	101.7	11.1	10.8*	11.1	94.2	14.7	19.4*	12.5
Competence	34.5	5.4	5.6*	5.8	30.2	7.2	10.1*	6.3
Concerns	27.8	4.9	3.1*	4.4	26.1	5.1	5.2*	4.5
Readiness	35.2	3.7	1.9*	3.9	34.9	4.2	3.7*	4.0

* t-test indicated a *p*-value < 0.001

Table 3 Multivariable (MV) regression of BOOK and OOAS overall and subscale pre-post change scores (Mean and SD) and selected exposures, by overdose risk category

	BOOK						OOAS					
	High risk of opioid overdose			Low risk of opioid overdose			High risk of opioid overdose			Low risk of opioid overdose		
	Mean	SD	MV regression	Mean	SD	MV regression	Mean	SD	MV regression	Mean	SD	MV regression
Sex												
Male	2.1	2.7	ref	4.7	4.2	ref	11.0	11.5	ref	19.3	13.2	ref
Female	2.1	2.4	0 (-0.2-0.2)	5.3	4.1	-0.1 (-0.2–0.3)	10.3	9.6	-0.3 (-1.7-1.2)	19.5	11.8	-0.9 (-2.4-0.4)
Age category												
< 25 years	4.1	3.0	0.2 (-0.9-1.2)	4.8	4.2	0.6 (-0.5-0.6)	20.0	16.3	4.5 (-2.2-11.1)	18.3	10.1	-2.3 (-5.6-0.9)
25–29 years	2.2	2.6	0.2 (-0.2-0.7)	4.4	4.1	0.5 (0.0-0.9)*	14.4	13.6	0.1 (-2.8-3)	21.6	13.2	0.9 (-1.7-3.4)
30–39 years	2.0	2.5	-0.5 (-0.8–0.1)**	5.9	4.1	0.0 (-0.3-0.4)	10.1	10.4	-2.5 (-4.4–0.6)**	20.2	12.8	-2.6(-4.6–0.6)*
40–49 years	2.1	2.8	-0.3 (-0.6-0.0)*	5.0	4.2	0.3 (-0.1-0.6)	11.2	11.2	-1.2 (-3.1-0.8)	18.3	12.4	-0.9 (-2.9-1.2)
> 50 years	2.1	2.5	ref	3.9	3.9	ref	10.3	11.5	ref	18.7	12.4	ref
DAST-10												
No-substantial level problems	2.1	2.7	ref	-	-	-	11.4	11.3	ref	-	-	-
Severe level problems	2.0	2.5	0 (-0.2-0.2)	-	-	-	10.5	11.0	0.5 (-0.7-1.7)	-	-	-
Current drug treatment												
Yes	2.0	2.8	ref			-	10.4	11.7	ref			-
No	2.1	2.5	0.6 (0.4–0.8)***			-	11.1	10.8	1.3 (0.1–2.4)*			-
Ever overdosed												
Yes	2.0	2.5	ref			-	11.1	10.9	ref			-
No	2.2	2.9	-0.3 (-0.5-0)*			-	10.2	11.7	-0.6 (-2-0.7)			-
Ever witnessed an overdose												
Yes	2.0	2.6	ref	3.6	3.7	ref	10.9	11.0	ref	15.8	12.1	ref
No	3.1	2.9	0.1 (-0.3-0.5)	7.7	3.7	0.5 (0.2–0.8)**	10.7	13.0	-2.3 (-4.9-0.3)	25.9	10.6	0.1 (-1.5-1.8)

Note. Multivariable regression analyses controlled for baseline score. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

related harms, potentially dispelling entrenched myths around overdose response (e.g., injecting salt/stimulants) that have long been documented [20].

In relation to the other variables we examined, in general, those with more overdose experiences (either as a witness or personally experiencing overdose) showed less improvement, likely due to higher levels of knowledge at baseline. Similar findings have been reported in the literature [4], potentially indicating ceiling effects.

Our study was limited by non-random convenience sampling meaning that findings cannot be generalized to the wider population. Further, we only assessed post intervention changes directly after training and it is possible that the increases in knowledge and improved attitudes we observed may dissipate over time. Further work is needed to determine whether refresher training is needed and, if so, when it should be administered (e.g., annually). We also used injecting drug use as the key marker of high personal risk of opioid overdose, meaning that those who don't inject but may nonetheless be at overdose risk (e.g., in treatment, classified by DAST-10 as experiencing severe substance 'abuse', previous overdose) were excluded from analysis. This group was only small, and we are confident that our stratification captured the key differences in overdose risk in which we were most interested. Finally, all data were collected using self-report which may be subject to social desirability bias. Previous work suggests that self-report amongst people who inject drugs is reliable under many circumstances [21], and we would assume this would similarly apply to participants in both personal opioid overdose risk categories.

Our study shows that large improvements in knowledge about opioid overdose and appropriate responses and opioid overdose attitudes amongst potential opioid overdose witnesses can be achieved with the S-O-S training materials in LMICs. Importantly, these changes are evident amongst people at high personal risk of opioid overdose, in this case people with a history of injecting drug use, as well as those we classified as being at low personal risk of opioid overdose. Use of the S-O-S training package provides a scalable way for United Nations

member states to respond to the recommendations of the UNGASS outcome documents and resolution 55/7 of the Commission on Narcotic Drugs [9] to help prevent opioid overdose mortality. Inevitably, such a response needs to be grounded in local contexts requiring adaptation, consultation and negotiation to align with in-country systems to ensure successful implementation.

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Author contributions
PD developed the study, analytic strategy and wrote the main draft. SCF analysed data and contributed to manuscript drafting. VP, GG, GC and WK obtained funding for the study, supported its implementation and contributed to manuscript drafting. DD, TK, DN and AT coordinated the study in their countries, contributed to study design and manuscript drafting. KH contributed to the development of project materials and training and manuscript drafting. DK and AB obtained funding for the study, coordinated its implementation and contributed to manuscript drafting. All authors approved the submitted manuscript.

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Data availability
Data may be requested directly from the authors. Requests for reasonable access will be considered on a case-by-case basis.

Declarations

Competing interests
The authors declare no competing interests.

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