

# Anxiety and perceived psychological impact associated with needle stick and sharp device injury among tertiary hospital workers, Vientiane, Lao PDR

Chieko MATSUBARA<sup>1, 2\*</sup>, Kayako SAKISAKA<sup>2-4</sup>, Vanphanome SYCHAREUN<sup>5</sup>,  
Alonkone PHENSAVANH<sup>5</sup> and Moazzam ALI<sup>6</sup>

<sup>1</sup>National Center for Global Health and Medicine, Japan

<sup>2</sup>Graduate School of Medicine, The University of Tokyo, Japan

<sup>3</sup>Teikyo University Graduate School of Public Health, Japan

<sup>4</sup>National Center of Neurology and Psychiatry, National Institute of Mental Health, Japan  
Support Center for Suicide Countermeasures, Japan

<sup>5</sup>Faculty of Postgraduate Studies, University of Health Sciences, Lao PDR

<sup>6</sup>Reproductive Health and Research, World Health Organization, Switzerland

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**Abstract:** Occupational needle stick and sharp injuries (NSSIs) affect healthcare workers' (HCWs') mental health, however, limited evidence is available on the psychological impact of NSSIs, especially in developing countries where most of NSSIs have been reported. A cross-sectional study was conducted to evaluate the anxiety and psychological impact regarding NSSIs among HCWs at tertiary hospitals in Lao PDR. In this study, four among seven items of anxiety scale in Hospital Anxiety and Depression Scale (HADS) (Cronbach's  $\alpha=0.80$ ) was applied. Participants who experienced NSSIs in the past 6 months showed significantly higher anxiety scores than those who did not experienced ( $p=0.004$ ) and the average anxiety scores was high shortly after the NSSI. The 42.7% of them were more afraid of needles and sharp devices in the 2 wk after the NSSI than the time of the interview. The results encourage developing countries to adapt a comprehensive NSSI management policy including not only to take adequate precaution measures but psychological support and treatment for HCWs from immediately after NSSIs to improve safety for HCWs and patients. Further studies are needed to develop normative psychiatric scales with cultural adaptation in developing countries which provide convenient mental disorder assessment after NSSIs.

**Key words:** Anxiety, Hospital, Lao PDR, Needle stick and sharp device injury, NSSI, Occupational Health, Psychological impact

## Introduction

The World Health Organization (WHO) estimated that contaminated injections caused annually 21 million the

\*To whom correspondence should be addressed.

E-mail: c-matsubara@it.ncgm.go.jp

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hepatitis B virus (HBV) infections, two million of hepatitis C virus (HCV) infections and 260,000 human immunodeficiency virus (HIV) infections. These infections caused to 49,000, 24,000, and 210,000 deaths, respectively. The 40% of the global burden of HBV and HCV infection among Health Care Workers (HCWs) is attributable to occupational exposure<sup>1, 2)</sup>. Unsafe injections are responsible for millions of cases of HBV and HCV infection, and an estimated one-quarter of a million cases of HIV infection annually, while the incidence being highest in Asia<sup>3)</sup>. Unsafe injections place patients at risk of disability and death.

Occupational needle stick and sharp injuries (NSSIs) put HCWs at a risk of viral infections from blood borne pathogens such as the HBV, HCV, and HIV. The WHO defines 'a NSSI' as the parenteral introduction into the body of blood or other potentially infectious material by hollow-bore needles, lancets, scalpels, and contaminated broken glass used during the performance of duties<sup>4)</sup>. Despite efforts for reducing NSSIs such as safety-engineered equipment<sup>5)</sup>, protective wears, puncture-resistant waste containers at worksite, the compliance of universal precaution and managed working condition, NSSIs continue to occur, and more than 90% of NSSI-related infections occurred in developing countries<sup>6)</sup>.

Underreporting is a significant issue across all disciplines and is complicated by many factors including fear, lack of time, punitive outcomes, inadequate reporting and post-exposure protocols, and misperception about the level of risk<sup>7, 8)</sup>. Estimates of unreported needlestick injuries range from 30% to 73%<sup>9, 10)</sup>.

The accidental occurrence of occupational NSSIs affects HCWs' mental health by causing anxiety, depression, and Post-Traumatic Stress Disorder (PTSD)<sup>11-13)</sup>. Studies suggest that NSSIs might interfere with HCWs' daily lives, regular practices at work, and professional careers<sup>13, 14)</sup>. However, limited evidence is available on the psychological impact of NSSIs. Further, no such studies have been conducted in developing countries, where most of NSSIs have been reported to occur.

The Lao People Democratic Republic (Lao PDR) is a landlocked country in Southeast Asia bordered by Vietnam, China, Myanmar, Cambodia, and Thailand. The Lao PDR government started the National Poverty Eradication Program in 2003. However, in 2006, the percentage of the country's GDP invested on health was still 1.5%. The estimated prevalence rate of HIV, HBV and HCV are 0.1% in 2006<sup>15)</sup>, 8.7% as of 2018<sup>16)</sup> and 0.7% as of 2018<sup>16)</sup>, respectively. Lao PDR was one of the most affected countries by liver cancer in the world in 2012<sup>16)</sup>. A report noted that

poor injection practices were rife<sup>17)</sup>. NSSIs have occurred during waste disposal and cleaning among non-medical staff, and that is happening among medical staff as well<sup>18)</sup>. The government of Lao PDR has set "the National policy for injection safety and safe disposal of injection equipment", but compliance rates are unknown. Further, another study held a warning for newly introduced disposable safety syringes which endangered HCWs at risk of infection due to insufficient waste bins and incinerators in Lao PDR in 2004<sup>19)</sup>. As in many countries, HCWs are recommended to receive 3 doses of HBV vaccine; however, such national safety management policy for HCWs, such as immunization and post prophylaxis regulation after NSSIs, has not been fully implemented in Lao PDR. This study aimed to evaluate the anxiety and psychological impact associated with NSSIs among HCWs in Lao PDR.

## Subjects and Methods

### *Study site and subjects*

We performed a cross-sectional study; some parts of method have been described in our previous publication<sup>18)</sup>. The study was conducted at four tertiary hospitals in Vientiane Capital, Lao PDR: Mahosot Hospital, Sethathirath Hospital, Friendship Hospital, and Mother & Children Hospital. Participants were all full-time HCWs including both medical staff and non-medical staff. Two other facilities in Vientiane Capital, a military and police hospital, were not able to participate. Mahosot Hospital, Sethathirath Hospital, and Friendship Hospital have 450, 220, and 250 hospital beds, respectively, and provide emergency medicine and general practice<sup>20)</sup>. These hospitals had (414,486; 55,264; 18,982), (66,404; 13,146; 16,258), and (129,331; 13,114; 42,471) out-patients, emergency patients, and in-patients, respectively, in 2013<sup>20)</sup>. All four hospitals provide maternal and child health service, especially Mother & Children Hospital<sup>20)</sup>.

### *Questionnaire*

A structured questionnaire assessed participants' socio-demographic characteristics, experience of NSSI(s) in the past 6 months, anxiety, and fear of needled and sharp devices as an impact of the NSSI(s) experienced. The questionnaires were originally developed in English and translated into Lao language by two Lao native speakers, then the translation was checked by two native Lao speakers, and back translated by four translators.

### Anxiety

Anxiety was measured using a part of the Hospital Anxiety and Depression Scale (HADS), which was developed by Zigmond *et al.* at UK in 1983 (User registration with the NFER Nelson, UK)<sup>21</sup>. HADS is a rapid self-reported questionnaire comprising two subscales (anxiety and depression), each comprising seven items. Each item is rated on a 4-point Likert-type scale of 0–3 points, generating a total score of 0–21 points, with higher scores representing a greater severity of anxiety. The HADS has been widely used for initial diagnosis<sup>22</sup>, however, thresholds for clinical decisions varied across studies: review papers demonstrated that the optimal threshold was a score 7 or 8 or above for the HADS anxiety subscale<sup>23, 24</sup>.

HADS has been translated into more than 50 languages<sup>25</sup>, however, recent studies identified difficulties in translation from British English and cross-cultural use of the HADS<sup>26, 27</sup>. In the process of being developing HADS, it excluded items which are explicit reference to psychiatric symptoms and physical disorder like a somatic disorder. Further, HADS items are originally written in colloquial British English, notably “I get a sort of frightened feeling like ‘butterflies’ in the stomach” and response options are varied across in items both wording and degree<sup>26</sup>. These characteristics has been posing difficulties in validation of translated versions of HADS, demonstrated as discrepancy of cut off points<sup>26</sup> and inconsistency of factor structures<sup>27</sup>.

As the objective of this study was not to diagnose or treat any anxiety disorder, after conducted several translations and back translations by two translators and four back translators, we applied 4 items among 7 HADS’ anxiety items<sup>21</sup> in this study as shown below, which we could confirm content validity including cultural adaptation.

- A1. I feel tense or ‘wound up’.
- A5. Worrying thoughts go through my mind.
- A7. I can sit at ease and feel relaxed.
- A13. I get sudden feelings of panic.

Therefore, the anxiety index used in this study ranged from 0 to 12. The logic of combination of the 4 items was confirmed by a high Cronbach’s reliability score (Cronbach’s  $\alpha=0.80$ ).

### Psychological impact

To measure the psychological impact of NSSIs, we asked the following questions, which were used in a former study<sup>28</sup>. The questions are as follows:

-How much more afraid of needle and sharp devices were you in the 2 wk after the NSSI?

- How much more afraid of needle and sharp devices are you today?

Responses were rated on a 5-point Likert-type scale, and higher scores represented greater severity of NSSI-related fear. These questions were posed to all respondents who had experienced an NSSI in the past 6 months.

### Data collection

Data were collected from May to June 2006 through face-to-face interviews using the structured questionnaire. Supervised by the principal author, 5 native interviewers underwent a 2-d training that included interviewing manners and techniques. Before the interviews, the interviewers individually informed the respondents of the objectives and confidentiality measures used in the study. The respondents who agreed and willingly signed the informed consent sheet participated in this study.

All HCWs interviewed were informed about the objectives, the interview procedures, the possibility that the results would be utilized for conference(s) or publication(s) without disclosing any personal information, and the confidentiality of personal information; this was done through an information sheet before the interview. The HCWs were offered an opportunity to refuse further participation at any time during the interview. A written consent was obtained prior to the interview.

The study protocols and tools were reviewed and approved by the Research Ethics Committee of the University of Laos (/FMS.2006) and of the Graduate School of Medicine, the University of Tokyo (1402).

### Data analysis

Data were analysed using the IBM SPSS Statistics 21 and the Microsoft Excel 2010. The average anxiety scores were compared between 2 groups: the NSSI group that comprised those who experienced an NSSI (s) in the past 6 months, and the non-NSSI group that comprised those who had not experienced the same, using a Student’s t-test. Administrators and pharmacists were excluded from the Student’s t-test, as none of them reported NSSI in this study. *P*-value <0.05 was considered statistically significant. Furthermore, NSSIs for the past 6 months were selected according to the period since the NSSI such as 1 wk, 2 wk, 1 month, 2 months. The average of anxiety scores in each period was calculated and were plotted by the time. A power approximation curve was calculated by the average anxiety scores in which outliers and extreme outlier were not included.

In addition, we demonstrated the psychological impact of

HCWs by comparing the fear for needled device between 2 wk after the injury and at the time of the interview in HCWs who experienced the NSSI(s) in the past 6 months.

**Results**

The total study population was 932 and the response rate was 71.1%; some sociodemographic information of the participants has been shown in our previous publication<sup>18</sup>. The participants of each of four hospitals comprised of 400 (64.0%), 257 (75.0%), 203 (62.6%), and 72 (55.1%), respectively. The occurrence of NSSIs was 42.1% over the hospital staff members' entire careers, and the occurrence in the past 6 months was 11.4%. Most respondents were female (78.0%) and almost half of the respondents were nurses (50.1%, 467/932). The average age was 36.8 yr (SD=9.9). Univariate analysis showed a significant association between occupation and the NSSIs in the past 6 months as shown in Table 1. The NSSIs in the past 6 months did not show significant associations with gender, age and the length of work experience.

Figure 1 shows the distribution of the anxiety scores for the non-NSSI (1-a) and NSSI groups (1-b). The average

anxiety scores were significantly different in the NSSI (Mean=3.91, SD=1.69) and non-NSSI (Mean=3.44, SD=1.48) groups ( $p=0.004$ ,  $t=2.91$ ,  $\eta^2=0.01$ ) (1-c).

Figure 2 shows the prevalence of the anxiety scores by the time since the NSSI in the past 6 months and the power approximation curve. The approximation curve had  $R^2=0.53$ .

Table 2 shows the psychological impact of the NSSIs between two weeks after the NSSI and at the time of the interview. Among the NSSI group participants, 73.2% (60/82) felt 'Slightly afraid', 'Moderately afraid', 'Quite afraid' and 'Very afraid' of needled devices in 2 wks after the NSSI. Furthermore, 47.6% (39/82) feel afraid of needled devices at the time of the interview ('Slightly afraid', 'Moderately afraid', 'Quite afraid', and 'Very afraid'). About the fear of needled devices, 42.7% (35/82) chose a stronger fear option in 2 wk after the NSSI than at the time of interview.

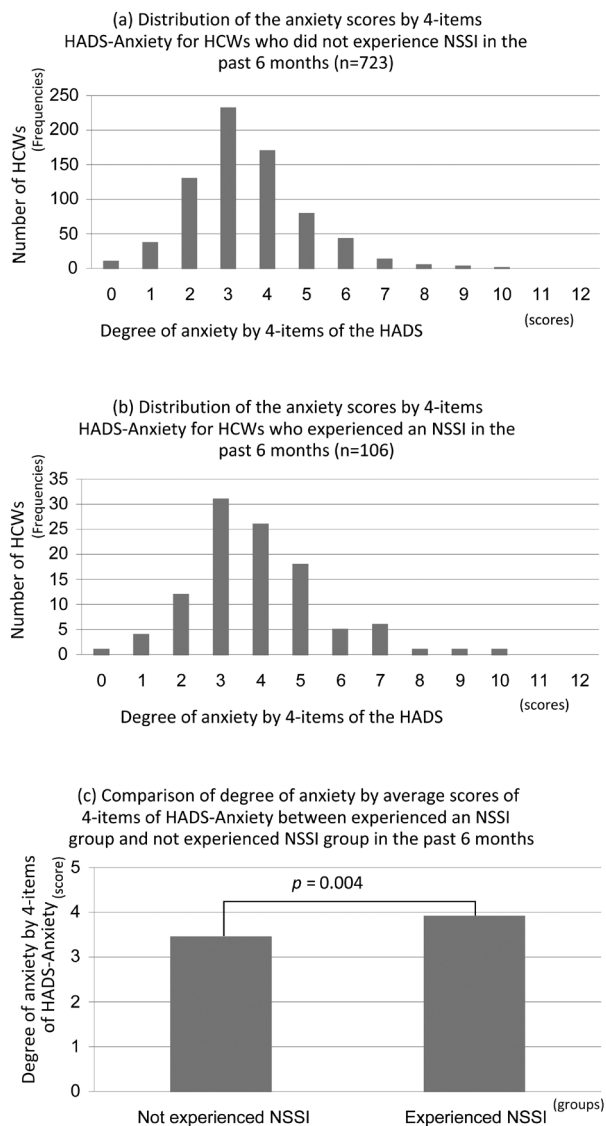
**Discussion**

The average anxiety score of the NSSI group was significantly higher than the non-NSSI group ( $p=0.004$ ).

**Table 1. Univariate analysis of NSSIs in the past 6 months among HCWs at four tertiary hospitals in Vientiane, Lao PDR (2006 study) (n=932)**

	NSSIs in the past 6 months			p-value
	Yes (%)	No (%)	Total	
Gender	106 (11.4)	826 (88.6)	932	0.409
Male	20 (9.8)	185 (90.2)	205	
Female	86 (11.8)	641 (88.2)	727	
Age (yr)				0.318
<37	46 (10.3)	401 (89.7)	447	
≥37	60 (12.4)	425 (87.6)	485	
Work career (yr) (Median, 10)				0.661
<10	49 (10.7)	407 (89.3)	456	
≥10	55 (11.7)	417 (88.3)	472	
(missing, 4)				
Occupation				<0.001
Physician	8 (7.7)	96 (92.3)	104	
Surgeon	13 (24.5)	40 (75.5)	53	
Dentist	3 (15.8)	16 (84.2)	19	
Nurse	60 (12.8)	407 (87.2)	467	
Laboratory	9 (11.7)	68 (88.3)	77	
Accupuncturist	3 (60.0)	2 (40.0)	5	
Pharmacist	0 (0.0)	35 (100.0)	35	
Other healthcare staff	1 (4.8)	20 (95.2)	21	
Administrator	0 (0.0)	82 (100.0)	82	
Cleaner	9 (13.0)	60 (87.0)	69	

NSSIs: needle stick and sharps injuries; HCWs: health care workers; PDR: People's Democratic Republic.



**Fig. 1. Distribution and comparison of the anxiety scores by 4-items of HADS-Anxiety for the NSSI in the past 6 months among HCWs at four tertiary hospitals in Vientiane, Lao PDR (2006 study).**

(a) Distribution of the anxiety scores for HCWs who did not experience NSSI, (b) Distribution of the anxiety scores for HCWs who experienced an NSSI, (c) Comparison of degree of anxiety by 4-items of HADS-Anxiety between experienced an NSSI group and not experienced NSSI group.

HADS: The Hospital Anxiety and Depression Scale; HCWs: health care workers; NSSI: needle stick and sharp device injury; PDR: People's Democratic Republic.

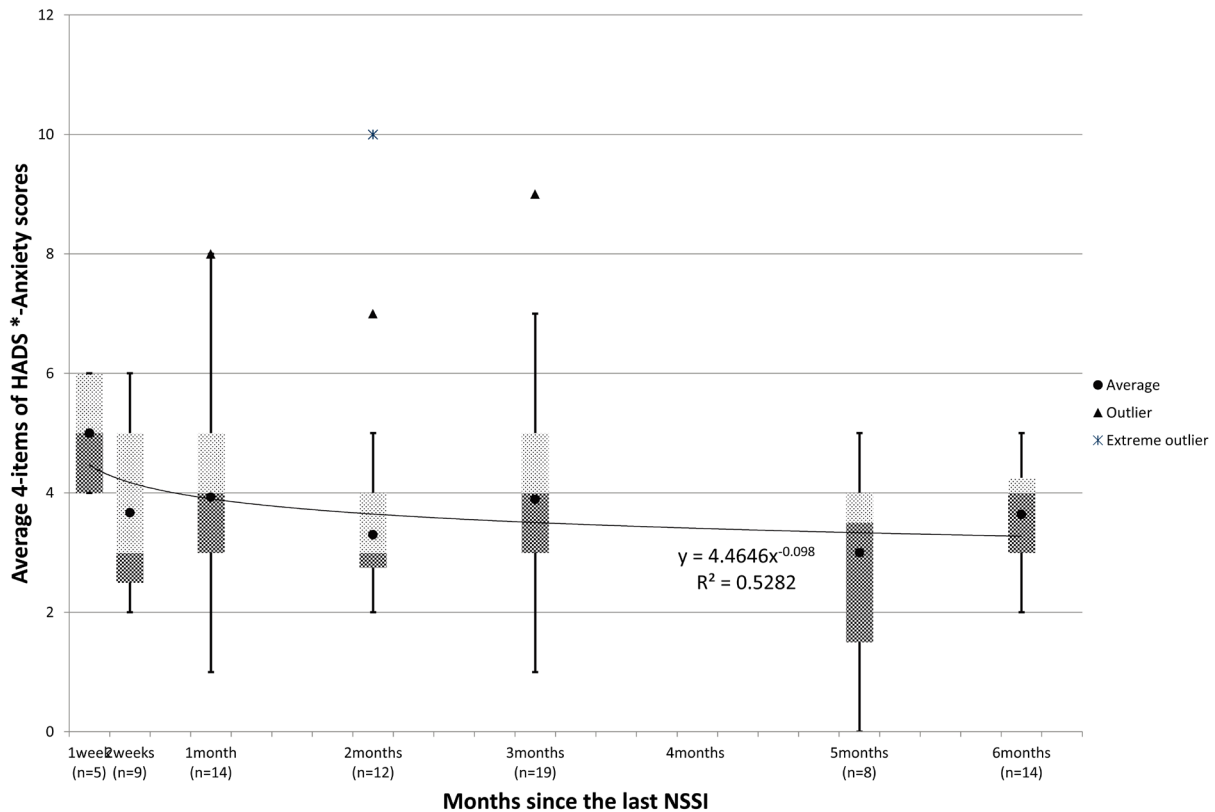
A significant higher anxiety was also demonstrated by the Hamilton Anxiety Scale after NSSIs in Korea, similar to this study<sup>29</sup>). The uncertainty of the infection transmitted from the NSSI might have raised the anxiety of HCWs<sup>11, 29</sup>). The high anxiety scores also would be because of inadequate measures and treatments against the

exposure. Previous studies reported that the level of the anxiety was higher when HCWs had not been vaccinated in Korea<sup>29</sup>) and that adequate availability of needles, syringes, and sharp equipment (odds ratio, 0.47) and attendance to educational or refresher courses on safety regarding NSSIs (odds ratio, 0.50) were the protective factors of NSSIs among nurses in Lao PDR<sup>18</sup>). Adequate precautions to reduce the risk of NSSI is of primary importance, especially in developing countries, and then it is also necessary to reduce anxiety caused by the NSSI.

Moreover, the present study suggested that the time-series of anxiety with high average scores shortly after the NSSI ( $R^2=0.53$ ). This high anxiety might be partly explained by the higher level of uncertainty if the exposed blood was confirmed to be infected with HIV, HBV or HCV<sup>11</sup>). HCWs, whose anxiety score is very high after the NSSI, may need to support coping strategies to deal with their high anxiety. A convenient mental disorder assessment would be one of the helpful options in developing countries as applied in this study. Further attention should be started immediately after NSSIs to cope with HCWs' anxiety at the hospitals.

This study suggested that NSSIs has an anxiety impact on the HCWs. The 42.7% of participants answered higher anxiety scores in the question that they were more afraid of needled and sharp devices in the 2 wk after the NSSI than that at the time of the interview. During the interviews, the interviewers heard anecdotal reports from several respondents that some of their colleagues could not continue their job and had resign from their job because of the worries and anxieties after experiencing NSSIs. A study suggested an association between NSSIs and depressive symptoms<sup>30</sup>). The psychological impact of NSSIs needs to be recognized as a latent threat to HCWs' mental health. National policy guidelines on NSSI management should be comprehensively revised; adequate precaution measures are to be taken such as gloves, aprons, puncture-resistant waste containers at worksite, safety-engineered devices, hospital systems such as infection control team (ICT), vaccination, post-prophylaxis exposure and so on, but also the psychological support of the HCWs to be compromised.

This study found 42.1% of hospital workers experienced NSSIs over entire careers and 11.4% of them experienced in the past 6 months. Previous studies from developing countries, which reported the rate of NSSIs among hospital workers over entire careers, showed that the rates of NSSI were similar or higher, but the differences were less than twice comparing to this study: West African countries



**Fig. 2.** Box plot chart of the 4-items of the HADS-Anxiety scores by the time since the NSSI in the past 6 months and the approximation curve calculated by the average anxiety scores among HCWs at four tertiary hospitals in Vientiane, Lao PDR (2006 study). HADS: The Hospital Anxiety and Depression Scale; NSSI: needle stick and sharp device injury; HCWs: health care workers; PDR: People’s Democratic Republic.

**Table 2.** Comparison of the psychological impact of a NSSI between 2 wk after the injury and at the time of the interview in HCWs who experienced the NSSI in the past 6 months at four tertiary hospitals in Vientiane, Lao PDR (2006 study) (n=82)

		How much more afraid of needled devices are you today?				
		Not afraid at all	Slightly afraid	Moderately afraid	Quite afraid	Very afraid
How much more afraid of needled devices were you in the 2 wk after the injury?	Not afraid at all	20	2	0	0	0
	Slightly afraid	11	12	3	1	0
	Moderately afraid	6	2	4	1	0
	Quite afraid	6	4	2	1	0
	Very afraid	0	1	2	1	3

NSSI: needle stick and sharps injury; HCWs: health care workers; PDR: People’s Democratic Republic.

(45.7%)<sup>31</sup>, Turkey (64.1%)<sup>32</sup>, Ethiopia (63.6%)<sup>33</sup>, Nepal (74.3%)<sup>34</sup>, and Thailand (55.5%)<sup>35</sup> (The first four papers are NSSIs for the past 6 months, and the last paper is NSSIs for the past year). The variation on the rates of NSSIs may be due to variations in scope of hospital services. This comparison suggests that the findings from this study might be carried out in other developing countries, with comparing the working environment.

The present study showed that HADS and other psycho-

logical scales could be helpful tools to identify healthcare workers who need psychological support and treatment in developing countries, where psychiatric specialists are limited. The joint policy guidelines of the WHO and International Labour Organization (ILO) identified the retention of healthcare workers as a key challenge in maintaining strong health systems<sup>36</sup>. Therefore, further researches need to develop a normative psychiatric scale with cross-cultural validity to screen anxiety and other

mental health problems in Lao PDR and other developing countries. In addition to the potential for adverse health outcomes, future researches should focus on injury-related costs which may include medical treatment, lost wages, and legal liability. Such safety management systems will improve safety for both HCWs and patients<sup>37)</sup>.

This study has some limitations. First, in keeping with the nature of a cross-sectional study, a causal relationship between NSSI experience and anxiety was not identified. Second, as the data included self-reported responses, there might be some recall biases. Third, the questionnaire did not include the full anxiety scale of the HADS questionnaire; therefore, the study could not identify caseness of anxiety, but this study still compared the relative strength of anxiety after NSSIs by the anxiety index which provided a proper high reliability. Fourth, one of the outcome measurements, related to the fear for needled devices, should be further assessed since they are not standardized nor validated. Since three participants answered that they were very afraid of needled devices at the time of interview, it may have reflected a selection bias that resulted in a ceiling effect. Fifth, data collection was over 15 yr ago, work environment and education systems has been improved since the time of data collection, however, the work environment still has room for improvement and the problems to be solved. As for anecdotal reports in 2019, for one thing, only one of the four hospitals provided the ICT in 2006, but in 2009, all hospitals have established the ICT, that manage surveillance, HCWs training, waste management post-exposure prophylaxis and so on. For another, precaution measures and equipment still have not yet been adequate. Therefore, there have been growing expectations of the comprehensive NSSI management policy that encourage both precaution measures in order to reduce the risks of NSSIs and psychological support to cope with HCWs' anxiety after NSSIs.

## Conclusion

The level of anxiety was higher in the group that had experienced an NSSI in the past 6 months than in the group that had not, and NSSIs appeared to have a psychological impact on the HCWs who experience them. The results of this study encourage hospitals in Lao PDR and other developing countries to adapt comprehensive NSSI management policy that take adequate precaution measures and psychological support and for HCWs from immediately after NSSIs to improve safety for both HCWs and patients<sup>38)</sup>. Further studies are needed to develop

normative psychiatric scales with cultural adaptation in developing countries.

## Disclaimer

This study contains the collective views of an international group of experts, and does not necessarily represent the decisions or the stated policy of the WHO.

## Author Contributions

Conceived and designed the experiments: Chieko MATSUBARA, Kayako SAKISAKA, Alongkone PHENSAVANH and Moazzam ALI. Performed the questionnaire study: Chieko MATSUBARA, Vanphanom SYCHAREUN and Alongkone PHENSAVANH. Analyzed the data: Chieko MATSUBARA, Kayako SAKISAKA and Moazzam ALI. Contributed materials: Chieko MATSUBARA, Kayako SAKISAKA, Vanphanom SYCHAREUN, Alongkone PHENSAVANH and Moazzam ALI. Wrote the paper: Chieko MATSUBARA. Contributed substantially to manuscript revisions: Chieko MATSUBARA, Kayako SAKISAKA, Vanphanom SYCHAREUN and Alongkone PHENSAVANH and Moazzam ALI. Monitored and supervised study progress: Kayako SAKISAKA and Moazzam ALI.

## Conflict of Interest

The authors declare that there are no conflicts of interest.

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