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Nonmedical prescription drug use of analgesics and sedatives/hypnotics in Taiwan: Results from the 2014 National Survey of Substance Use

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ABSTRACT

Nonmedical prescription drug use (NMPDU) has become a major public health issue but little is known in Asian populations. This study aimed to investigate the prevalence and correlates of NMPDU in Taiwan. Participants from the 2014 national survey of 17,837 individuals, aged 12 to 64 year, completed anonymously a computer-assisted self-interview. Past-year prescription drug use was divided into medical use only (MUO) and nonmedical use (NMU), defined as using the drug without a prescription, or more frequently, or in larger doses than prescribed. Problematic alcohol use was measured using the Alcohol Use Disorders Identification Test (AUDIT), problematic drug use using the 20-item Drug Abuse Screening Test (DAST), and depressive symptoms using the Center for Epidemiological Study-Depression (CES-D). The prevalence of past-year NMU was 3.02% for analgesics, 0.71% for sedatives/hypnotics, and 3.66% for either drug, with a very small overlap of NMU between analgesics and sedatives/hypnotics (0.07%). When individuals with NMU were compared to those without NMU (Non-NMU) and those with MUO, respectively, some correlates consistently identified, including young adulthood, tobacco smoking, alcohol drinking, and greater AUDIT's scores for analgesics, as well as hard drug use and greater DAST's scores for sedatives/hypnotics. NMU was associated with greater CES-D's scores for both analgesics and sedatives/hypnotics when compared to Non-NMU but not to MUO. Robust correlates of NMPDU could offer implications for development of prevention strategies of NMPDU.

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1. Introduction

Nonmedical prescription drug use (NMPDU) typically refers to the use of prescription drugs for reasons other than prescribed, for a dosage higher than prescribed, or simply without a doctor's prescription (United Nations Office on Drugs and Crime, 2011). NMPDU has become the second most prevalent illicit drug use in the United States (US), following only marijuana (Center for Behavioral Health Statistics and Quality, 2016). An increasing trend of NMPDU over the past few decades has been reported in the US (Hughes et al., 2016; Johnston et al., 2016; Martins et al., 2015), the European Union (EU) (Casati et al., 2012), and Latin America (United Nations Office on Drugs and Crime, 2011). However, the scale of NMPDU from the other regions of the world remains rarely available, including Asia.

Compared to people without NMPDU, those with NMPDU have been consistently associated with young adulthood (Center for Behavioral Health Statistics and Quality, 2016; McCabe et al., 2017c; Novak et al., 2016) and various ill-health status and risk behavior, including self-rated poor health (Becker et al., 2008; Havens et al., 2011), anxiety or depression (Becker et al., 2008; Chen et al., 2015; Cole and Logan, 2010; Havens et al., 2011; Kripke, 2007), poor sleep (Tang et al., 2016), suicidal behavior (Guo et al., 2016), problematic use of alcohol and tobacco (Abrahamsson and Hakansson, 2015; Becker et al., 2008; Garnier et al., 2009; McCabe, 2005; McCabe et al., 2006), and illicit drug use (Abrahamsson and Hakansson, 2015; Cole and Logan, 2010; Havens et al., 2011; Simoni-Wastila et al., 2004).

Besides, there has been increasing research on people who received prescription medications but reported medical use only (MUO). On one hand, people with MUO would imply that their anxiety or pain might be ameliorated such that their risk of developing substance use disorder decreased or not different from that of people not receiving such prescription medication (i.e., nonusers). For example, adolescents with MUO were not associated with substance use when compared with nonusers in the US (McCabe et al., 2007; McCabe and West, 2014) or European countries (Kokkevi et al., 2008), and MUO of sedatives/anxiolytics during adolescence did not increase risk of substance use disorders in adulthood (McCabe et al., 2017a). On the other hand, people receiving prescription medication might have diversion or turn into NMU because of the ease to access these medications. Adolescents who had recent MUO of anxiolytic or sleep medications were found to have increased risk of NMU of such medications during the follow-up (Boyd et al., 2015). Hence, it warrants to examine whether people with NMU were different from those with MUO, given that people using prescription medications might have some indications that were not present among people not receiving such medications. Factors consistently associated with NMU when compared to people without NMU as well as compared to people with MUO would imply a robust correlation that may have policy implications.

It has been found that MUO and NMU of prescription opioids/stimulants showed similar trends over time in the US (McCabe et al., 2014). Physician's prescriptions were found to be the major source of NMPDU (Saloner et al., 2017). It is conceivable that the risk of NMPDU increases when the prescriptions for psychotropics increased dramatically over years, as the case in the US (Kolodny et al., 2015) and the EU (Casati et al., 2012). In Taiwan, the implementation of National Health Insurance in 1995 (Cheng, 2015) may have further ramifications for the prescription of psychotropics. Under the system, patients have relatively easy access to receive prescription drugs with a low percentage of copayment and can get the prescribed medications at the clinic or hospital. Hence, there has been a 56% increase in opioid consumption from 362 daily defined dose in 2002 to 560 daily defined dose in 2007 (Pan et al., 2013), a 143% increase in the prescription prevalence of sedatives/hypnotics from 3.0% in 1997 to 7.3% in 2004 (Chien et al., 2007), and a 65% increase in the number of person-days for prescribed sedatives/hypnotics from 4.0% in 2002 to 6.6% in 2009 (Wang et al., 2014). Since NMPDU could not be estimated from these claims data, the scale of NMPDU in Taiwan remains unknown.

To fill in the gap in the literature over NMPDU in Asian populations, we turned to a nationally representative sample in Taiwan to investigate the prevalence of the NMPDU with prescription analgesics and sedatives/hypnotics as the study focus. To delineate the whole picture of prescription drug use, we divided past-year prescription drug use into NMU, MUO, and non-use. We compared individuals with any NMU to those without NMU (Non-NMU, including non-use and MUO) and those with MUO, respectively, for analgesics and sedatives/hypnotics across sociodemographic characteristics, licit substance and illicit drug use, and depression to further understand the user profiles for future prevention.

2. Methods

2.1. Participants

The 2014 National Survey of Substance Use was designed to assess psychoactive substance use in a nationally representative sample of individuals aged 12 to 64 years old, who were available for a face-to-face interview and were non-institutionalized civilians in Taiwan. Using a stratified, multistage, probability-proportional-to-size random sampling from the Taiwanese population household registry, 28,664 individuals were selected as potential participants. During the household interview, field workers (n = 161) would explain and obtain written informed consent and teach participants to operate a tablet computer. Participants received an honorarium of NT$ 100 (approximate US$3) for completing the interview.

A total of 17,837 participants, 4445 aged between 12 and 17 years and 13,392 aged between 18 and 64 years, completed the interview, with a response rate of 62.2%. The distributions of demographic characteristics of the 17,837 participants, whether in the adolescent or adult samples, were equivalent to those of their counterparts in the entire population. Detailed information about the sampling and methodology of the survey was available elsewhere (Chen et al., 2017; Chen et al., 2019). This study was approved by the Research Ethics Committee of the National Taiwan University Hospital (approval number: 201309034RINB).

2.2. Measures

Participants were asked to complete anonymously a computer-assisted self-interview on tablet computers, containing question items on sociodemographic variables, use and problematic use of psychoactive substance, and depressive symptoms, among others.

Questions used to assess the use of any prescription analgesics, which explicitly excluded over-the-counter analgesics, and sedatives/hypnotics, started with a question of ever use on a list of all the categories of analgesics (including ultracet, extract of *Glycyrrhiza glabra*, codeine phosphate, tramadol, guaiacol glyceryl ether, ipratropium bromide, opium tincture, morphine, tiotropium, and opium power) and sedatives/hypnotics (including stilnox, eurodin, xanax, ativan, lendormin, pfoshen, zaleplon, insopin, clonazepam, halcion, dormicum, and erispan) shown on the tablet. If respondents reported ever use of any prescription drugs, they would be further asked about their last time use, use of dosage and frequency. The questions about dosage and frequency were asked with three options, including lower than prescribed, the same as prescribed, and higher than prescribed. Past-year NMU was defined as the situation when participants used the analgesics and sedatives/hypnotics within past year without a prescription, or more frequently, or in larger doses than prescribed. If participants were prescribed the analgesics or sedatives/hypnotics within past year, but did not meet the criteria of NMU, they were classified as MUO.

The questionnaire also had sections on use of licit substances and illicit drugs or inhalants. The questions used to assess each substance or drug had a similar structure, starting with lifetime use and then

followed by questions regarding age of first use, average frequency of consumption, and recency of use. Licit substances assessed in the survey included tobacco, alcohol, and areca nut. It is noteworthy that selling these substances to individuals under 18 years is prohibited by law in Taiwan, though the enforcement of this regulation varies among shops. In terms of illicit drugs or inhalants, 21 types (including glue, pentazocine, ecstasy, N2O, phencyclidine, methamphetamine, LSD, heroin, GHB, marijuana, cocaine, ketamine, PMMA, 2C−B, FM2, Ma Gu, 5-MeO-DIPT, K2, mephedrone, bath salts, and methadone) were covered.

In addition, well-validated scales were used to assess problematic use of substance. Degree of nicotine dependence was assessed using the 6-item Fagerstrom Test for Nicotine Dependence (FTND) (Heatherton et al., 1991), with its validity demonstrated in Taiwanese smokers (Huang et al., 2008). Problems with alcohol use were measured using the Alcohol Use Disorders Identification Test (AUDIT) (Babor et al., 1992), with its validity demonstrated in inpatients of a general hospital in Taipei (Chen et al., 2005). Problematic drug use was measured using the 20-item Drug Abuse Screening Test (DAST) (Skinner, 1982; Skinner, 2001), with its validity demonstrated in psychiatric outpatients (Cocco and Carey, 1998; Yudko et al., 2007).

Depressive symptoms was ascertained using the 20-item version of the Center for Epidemiological Study-Depression (CES-D) for depression symptoms (Radloff, 1977), with excellent reliabilities and validity demonstrated in Taiwanese adolescents (Yang et al., 2004).

2.3. Statistical analysis

Analyses were conducted in two parts. First, we presented the weighted prevalence of past-year MUO and NMU, respectively, of prescription analgesics, sedatives/hypnotics, and either drug. Second, we compared the group of NMU to that of Non-NMU and MUO, respectively, using multivariable logistic regression analyses with adjustment for socio-demographics. Scores on FTND, AUDIT, DAST and CES-D were analyzed as continuous variables. Adjusted odds ratios (aORs) were provided with their 95% confidence intervals (CIs). All analyses were performed using the Survey Procedures in SAS 9.4 (SAS Institute Inc., Cary, NC, USA) to account for complex survey design.

3. Results

3.1. Weighted prevalence of past-year NMPDU

Out of 17,837 participants, 498 (a weighted prevalence of 3.02%) were grouped as NMU for prescription analgesics and 100 (0.71%) as NMU for sedatives/hypnotics. Based on the cross-tabulation (Supplemental Table S1), 587 (3.66%) participants were grouped as NMU for either analgesics or sedatives/hypnotics, with only 11 (0.07%) particiants reporting NMU of both drugs.

The majority of the individuals with NMU were due to their acquirement of the drugs without a doctor's prescription, i.e., 96.6% for prescription analgesics and 78% for sedatives/hypnotics. However, respondents had difficulty identifying the name of the prescription drugs that they ever used (91.6% for analgesics and 57.7% for sedatives/hypnotics). For individuals who could identify the name of their medications, opioid analgesics (e.g., codeine, tramadol, and morphine) was the most commonly reported for analgesics, whereas zolpidem (64.7%), estazolam (17.8%), alprazolam (14.1%), lorazepam (7.1%) and brotizolam (5.4%) were among the top five reported for sedatives/hypnotics. These were similar to the commonly prescribed analgesics (Supplemental Table S2) and sedatives/hypnotics (Supplemental Table S3) that were based on national health insurance claims data in Taiwan (Pan et al., 2013; Wang et al., 2014).

3.2. Socio-demographic profiles of MUO and NMU

Table 1 displays the sociodemographic characteristics of the groups of non-use, MUO, and NMU. For analgesics, NMU was associated with age (adolescents and old adults aged 45–64 had decreased likelihood versus young adults aged 18–34) and educational level (those not obtaining college level had decreased likelihood versus those with college level) when compared to Non-NMU, whereas NMU was associated only with age (old adults aged 45–64 had a decreased likelihood) when compared to MUO. In terms of sedatives/hypnotics, NMU was associated with marital status (being divorced or widowed had an increased likelihood versus being married) when compared to Non-NMU, whereas NMU was associated with age (old adults aged 45–64 had a decreased likelihood) when compared to MUO.

3.3. Use of other substances

NMU of prescription analgesics and that of sedatives/hypnotics also had differential associations with use of other psychoactive substance (Table 2). For analgesics, NMU was associated with use of licit substance (aOR being 2.35 for tobacco, 1.75 for alcohol, and 1.60 for areca nut) but not with use of illicit drugs when compared to Non-NMU. A similar pattern was found when NMU was compared to MUO; however, the magnitude of aOR tended to be smaller and the association with areca nut was no longer statistically significant.

Regarding sedatives/hypnotics, NMU was associated with use of licit substance (aOR being 2.57 for tobacco and 1.77for alcohol) and use of illicit drugs (the estimate of aOR, though significant, was unstable due to small number) when compared to Non-NMU. When compared to MUO, NMU of sedatives/hypnotics was associated only with use of hard drugs (unstable estimate due to small number).

3.4. Problematic substance use and depression

Also displayed in Table 2, for analgesics, NMU was associated with problematic substance use (aOR = 1.45 for tobacco smoking, 1.27 for alcohol drinking, and 1.27 for drug abuse) and depression (aOR = 1.28) when compared to Non-NMU. When compared to MUO, NMU of analgesics was associated only with problematic alcohol use (aOR = 1.16).

Regarding sedatives/hypnotics, NMU was associated with two problematic substance use (aOR = 1.25 for AUDIT and 2.5 for DAST) and depression (aOR = 1.59 for CES-D) when compared to Non-NMU. When compared to MUO, NMU of sedatives/hypnotics was associated only with use of illicit hard drugs and problematic drug use (aOR = 1.08 for DAST).

A relationship with NMU was considered robust if it was consistently found in comparing NMU to Non-NMU as well as to MUO. All of those robust correlates of NMU, except illicit drug use due to its small number, are plotted in Supplementary Fig. S1 (A) for analgesics (young adulthood, tobacco use, alcohol use, and greater AUDIT scores) and Fig. S1 (B) for sedatives/hypnotics (greater DAST scores). In addition, CES-D is also plotted in Supplementary Fig. S1 (A) and (B) to highlight its lack of association when compared to the group of MUO.

Finally, NMU of either analgesics or sedatives/hypnotics had a correlate profile as a combination of the correlates from NMU of analgesics and NMU of sedatives/hypnotics (Supplemental Table S4).

4. Discussion

In this population-based study of NMPDU in Taiwan, the first of its kind in Asia, the prevalence of past-year NMU was 3.02% for analgesics, 0.71% for sedatives/hypnotics, and 3.66% for either analgesics or sedatives/hypnotics, with a very small overlap of NMU between analgesics and sedatives/hypnotics (0.07%). In comparing NMU to both Non-NMU and MUO, some correlates of NMU were consistently identified, including young adulthood (18–34 years), tobacco smoking, alcohol drinking, and greater AUDIT's scores for analgesics, as well as hard drug use and greater DAST's scores for sedatives/hypnotics. NMU

Table 1
Weighted distribution ($\%_{wt}$) of sociodemographics for past-year non-use, medical use only (MUO), and nonmedical use (NMU) of prescription analgesics and sedatives/hypnotics, respectively, in the 2014 National Survey of Substance Use in Taiwan (N = 17,837).

	Analgesics					Sedatives/hypnotics				
	Non-use (N = 16,708)	MUO (N = 631)	NMU (N = 498)	NMU vs. Non-NMU[a]	NMU vs. MUO	Non-use (N = 17,001)	MUO (N = 736)	NMU (N = 100)	NMU vs. Non-NMU[a]	NMU vs. MUO
Variable	n ($\%_{wt}$)	n ($\%_{wt}$)	n ($\%_{wt}$)	aOR (95% CI)[b]	aOR (95% CI)[b]	n ($\%_{wt}$)	n ($\%_{wt}$)	n ($\%_{wt}$)	aOR (95% CI)[b]	aOR (95% CI)[b]
Sex										
Male	8367 (50.05)	319 (52.38)	236 (49.26)	1.01 (0.79–1.29)	0.96 (0.68–1.34)	8566 (50.45)	314 (43.22)	42 (51.95)	1.09 (0.64–1.86)	1.25 (0.68–2.27)
Female	8341 (49.95)	312 (47.63)	262 (50.74)	1.00	1.00	8435 (49.55)	422 (56.78)	58 (48.05)	1.00	1.00
Age (years)										
12–17	4261 (10.02)	99 (5.93)	85 (7.16)	0.53 (0.34–0.84)[d]	0.78 (0.42–1.44)	4430 (10.30)	13 (0.54)	2 (2.18)	0.17 (0.03–1.04)	1.59 (0.23–11.14)
18–34	4059 (32.88)	121 (23.55)	139 (35.27)	1.00	1.00	4210 (33.60)	85 (12.98)	24 (30.38)	1.00	1.00
35–44	2701 (20.40)	101 (19.34)	115 (25.01)	0.91 (0.63–1.32)	0.75 (0.43–1.28)	2761 (20.47)	126 (19.57)	30 (29.21)	1.54 (0.60–3.96)	0.68 (0.25–1.88)
45–64	5687 (36.70)	310 (51.18)	159 (32.56)	0.52 (0.35–0.76)[d]	0.32 (0.19–0.55)[d]	5600 (35.63)	512 (66.91)	44 (38.23)	1.03 (0.41–2.59)	0.28 (0.11–0.74)[e]
Marital status										
Married	7283 (51.16)	346 (59.25)	227 (52.09)	1.00	1.00	7330 (50.9)	477 (63.78)	49 (48.01)	1.00	1.00
Single	8421 (42.37)	235 (32.91)	222 (37.74)	0.78 (0.55–1.12)	0.79 (0.49–1.28)	8704 (43.01)	143 (19.82)	31 (36.99)	1.40 (0.63–3.14)	1.15 (0.49–2.69)
Divorced or widowed	1004 (6.47)	50 (7.84)	49 (10.17)	1.49 (0.95–2.32)	1.33 (0.70–2.54)	967 (6.09)	116 (16.40)	20 (15.00)	2.83 (1.10–4.74)[c]	1.08 (0.49–2.40)
Education										
≤ Junior high	4915 (22.88)	227 (28.60)	136 (28.69)	0.68 (0.48–0.96)[c]	0.79 (0.51–1.22)	4987 (22.66)	263 (35.55)	28 (22.74)	1.23 (0.60–2.53)	1.59 (0.75–3.38)
Senior high	6177 (33.23)	228 (34.41)	188 (33.06)	0.55 (0.37–0.80)[d]	0.72 (0.44–1.18)	6306 (33.11)	248 (34.9)	39 (44.11)	0.63 (0.29–1.40)	1.18 (0.53–2.66)
≥ College	5616 (43.89)	176 (36.99)	174 (38.25)	1.00	1.00	5708 (44.23)	225 (29.55)	33 (33.15)	1.00	1.00

[a] The group of Non-NMU includes people with non-use and people with MUO.
[b] Adjusted odds ratio and its 95% confidence interval controlling for all the sociodemographic variables in this table.
[c] $p < 0.05$.
[d] $p < 0.01$.
[e] $p < 0.001$.

Table 2
Weighted distribution ($\%_{wt}$) of concurrent substance use, problematic substance use, and depression for past-year non-use, medical use only (MUO), and nonmedical use (NMU) of prescription analgesics and sedatives/hypnotics, respectively, in the 2014 National Survey of Substance Use in Taiwan (N = 17,837).

	Analgesics					Sedatives/hypnotics				
Variable	Non-use (N = 16,708)	MUO (N = 631)	NMU (N = 498)	NMU vs. Non-NMU[a]	NMU vs. MUO	Non-use (N = 17,001)	MUO (N = 736)	NMU (N = 100)	NMU vs. Non-NMU[a]	NMU vs. MUO
	n ($\%_{wt}$)	n ($\%_{wt}$)	n ($\%_{wt}$)	aOR (95% CI)[b]	aOR (95% CI)[b]	n ($\%_{wt}$)	n ($\%_{wt}$)	n ($\%_{wt}$)	aOR (95% CI)[b]	aOR (95% CI)[b]
Tobacco	2703 (18.91)	153 (26.06)	145 (34.29)	2.35 (1.70–3.25)[h]	1.58 (1.02–2.43)[f]	2767 (19.09)	195 (27.61)	39 (40.79)	2.57 (1.08–6.11)[f]	1.42 (0.64–3.13)
Areca nut	1018 (6.34)	61 (9.81)	62 (12.28)	1.60 (1.03–2.50)[f]	1.19 (0.69–2.06)	1055 (6.46)	73 (9.74)	13 (11.16)	1.04 (0.49–2.22)	0.71 (0.28–1.80)
Alcohol	6737 (47.96)	291 (51.68)	264 (60.39)	1.75 (1.36–2.24)[h]	1.44 (1.00–2.06)[f]	6905 (48.50)	334 (45.96)	53 (62.83)	1.77 (1.06–2.96)[f]	1.40 (0.76–2.55)
Illicit drug	25 (0.20)	4 (0.38)	3 (0.37)	1.48 (0.38–5.78)	0.71 (0.12–4.12)	19 (0.14)	9 (0.99)	4 (4.17)	19.45 (6.38–59.34)[g]	3.03 (0.78–11.80)
Hard drug[c]	10 (0.10)	2 (0.24)	1 (0.16)	0.90 (0.11–7.33)	0.34 (0.06–1.87)	9 (0.09)	1 (0.07)	3 (3.41)	32.67 (7.01–152.35)[h]	56.74 (4.03–799.79)[g]
Club drug only[d]	18 (0.15)	2 (0.15)	2 (0.21)	1.35 (0.23–7.99)	1.47 (0.08–28.74)	13 (0.11)	8 (0.92)	1 (0.76)	4.71 (0.68–32.60)	0.52 (0.06–4.92)

	Analgesics					Sedatives/hypnotics				
Variable	Non-use (N = 16,708)	MUO (N = 631)	NMU (N = 498)	NMU vs. Non-NMU[a]	NMU vs. MUO	Non-use (N = 17,001)	MUO (N = 736)	NMU (N = 100)	NMU vs. Non-NMU[a]	NMU vs. MUO
	Mean (SD)	Mean (SD)	Mean (SD)	aOR (95% CI)[e]	aOR (95% CI)[e]	Mean (SD)	Mean (SD)	Mean (SD)	aOR (95% CI)[e]	aOR (95% CI)[e]
FTND	3.4 (2.6)	4.0 (2.6)	4.1 (2.6)	1.45 (1.22–1.74)[h]	1.28 (0.97–1.64)	3.4 (2.6)	4.0 (2.7)	4.1 (3.1)	0.97 (0.56–1.66)	0.85 (0.50–1.48)
AUDIT	1.5 (3.2)	2.0 (4.1)	2.6 (4.8)	1.27 (1.17–1.37)[h]	1.16 (1.03–1.32)[g]	1.5 (3.2)	2.1 (4.5)	2.8 (5.3)	1.25 (1.10–1.43)[f]	1.03 (0.89–1.19)
DAST	0.1 (0.9)	1.6 (2.8)	2.9 (3.2)	1.27 (1.19–1.33)[h]	1.06 (0.98–1.15)	0.1 (0.7)	1.9 (2.2)	3.4 (3.6)	2.50 (2.00–3.09)[h]	1.08 (1.02–1.15)[h]
CES-D	20.4 (4.9)	22.2 (5.7)	22.3 (6.0)	1.28 (1.17–1.42)[h]	1.04 (0.92–1.19)	20.4 (4.9)	22.9 (6.0)	23.6 (6.4)	1.59 (1.35–1.85)[h]	1.01 (0.86–1.18)

AUDIT = Alcohol Use Disorders Identification Test, CES-D = Center for Epidemiological Studies-Depression scale, DAST = Drug Abuse Screening Test, FTND = Fagerstrom Test for Nicotine Dependence.

[a] The group of Non-NMU includes people with non-use and people with MUO.

[b] Adjusted odds ratio and its 95% confidence interval controlling for all the sociodemographic variables in Table 1.

[c] Including heroin, methamphetamine, and methadone.

[d] Including marijuana, ecstasy, GHB, bath salts, Ma Gu, ketamine, FM2, PMMA, 2C−B, K2, mephedrone, and N_2O.

[e] Adjusted odds ratio and its 95% confidence interval per standard deviation increase in the scale score controlling for all the sociodemographic variables in Table 1.

[f] $p < 0.05$.

[g] $p < 0.01$.

[h] $p < 0.001$.

was associated with greater CES-D's scores for both analgesics and sedatives/hypnotics when compared to Non-NMU but not to MUO. These findings help shed light on the scale and correlates of NMPDU in Taiwan, and provide useful clues for prevention strategies.

4.1. Prescription regulations and socio-cultural differences

The prevalence of past-year NMPDU in this study (3.66%) was higher than that in a 2013 national survey in Japan (2.5%) (Kiyoshi et al., 2013). Nevertheless, these estimates were still lower than that reported in Western countries, particularly for sedatives/hypnotics. For example, the prevalence of NMU of analgesics and hypnotics was 4.7% and 5.8%, respectively, in the US (Hughes et al., 2016), and 5.0% and 5.8% in the EU (Novak et al., 2016). Several possible explanations could account for this, including differences in health insurance systems, physicians' prescription patterns, and socio-cultural attitudes toward prescription drugs. For instance, the amount of prescription opioids sold to pharmacies, hospitals, and doctors' offices quadrupled from 1999 to 2010 in the US (Drug Enforcement Administration, 2011; Paulozzi and Centers for Disease Control Prevention, 2011), indicating a tendency of over-prescription in the US (Chang et al., 2014). Another US study showed that NMU of prescription opioids was highly correlated with MUO over the past four decades (McCabe et al., 2017c), supporting the postulation that over-prescription might be the cause of the NMU of opioids epidemic in the US.

In contrast, all the prescription drugs are closely monitored under the National Health Insurance in Taiwan to promote rational medical practice implemented in every contracted medical facility (Wu et al., 2015). Thus, overlapping prescriptions or polypharmacy without reasonable medical indications would not be reimbursed (Wang et al., 2014). In addition, Asian Americans, compared to other racial/ethnic groups (Hispanics, African Americans, and Native Americans), had the lowest prevalence of substance use disorders in the US (Wu et al., 2011). Taken together, Asian socio-cultural attitudes might partially deter Asians from NMU of these medications (Wu and Blazer, 2015).

Although most respondents in this study had difficulty identifying the name of the medications, the commonly reported prescription analgesics (codeine) and sedatives/hypnotics (zolpidem, estazolam, alprazolam, lorazepam, and brotizolam) by respondents who could do so were similar to those in two previous studies that were based on national health insurance claims data in Taiwan (Pan et al., 2013; Wang et al., 2014). However, it should be noted that the majority of individuals with NMPDU in this study had the experience of acquiring the medications without a doctor's prescription, e.g., purchasing the medications at their own expense or obtaining from others.

4.2. NMU profiles of analgesics vs. sedatives/hypnotics

Among the sociodemographics examined in this study, there were two robust findings, i.e., young adulthood (18–34 years old) was associated with NMU of prescription analgesics, whereas lack of sex difference was found for NMU of both prescription analgesics and sedatives/hypnotics. The association of NMU of analgesics with young adulthood is consistent with findings from other countries (Center for Behavioral Health Statistics and Quality, 2016; McCabe et al., 2017c; Novak et al., 2016). And the finding of no apparent sex difference in NMPDU is also supported by many previous studies, including a survey in Japan (Tominaga et al., 2009), a meta-analysis in the US (Young et al., 2012), and a national survey among US adolescents (McCabe et al., 2017b). However, some previous studies on sedatives/hypnotics reported a higher prevalence either in men, e.g., several surveys in the EU (Novak et al., 2016), or in women, e.g., studies in the US (Simoni-Wastila et al., 2004) and Sweden (Abrahamsson and Hakansson, 2015). One possibility is that the categories of sedatives/hypnotics varied substantially across studies and future investigation on more specific sedatives/hypnotics is warranted to clarify the issue.

Intriguingly, the NMU of both types of drugs were found to have different substance use profiles. While NMU of analgesics was robustly associated with alcohol use and greater AUDIT scores, NMU of sedatives/hypnotics was robustly associated with illicit drug use and greater DAST scores. In previous studies, NMU of prescription analgesics and sedatives/hypnotics were both associated with illicit drug use, though the magnitude of the association was greater for NMU of sedatives/hypnotics than analgesics (Abrahamsson and Hakansson, 2015; Cole and Logan, 2010; Simoni-Wastila et al., 2004). Our finding was supported by a US study showing NMU of analgesics to be associated with a greater DAST score and a higher prevalence of substance use disorder in the follow-up (Boyd et al., 2009). A possible explanation for the lack of association of NMU of analgesics with illicit drug use in this study might be due to the prescription patterns of opioid analgesics in Taiwan. The prescription rates of opioids in Taiwan (Pan et al., 2013) has been much lower than that in the US (Han et al., 2015). In addition, as most previous studies reporting the relationship between NMU of prescription opioids and illicit drug use were focused on oxycodone (Kuehn, 2007), it was not covered in this study as oxycodone did not enter Taiwanese market until 2016. The variety of analegesics included in this study might also help explain their lack of association with illicit drug use.

On the other hand, the association of NMU of prescription analgesics with use and problematic use of alcohol is similar to the findings of US studies (Garnier et al., 2009; McCabe et al., 2006). Individuals with alcohol use disorders might have unsatisfactory pain control, which might increase their risk of NMU of analgesics. In addition, there might be common etiology underlying both NMU of analgesics and alcohol use problems, such as high impulsivity or certain psychiatric comorbidity (e.g., depression). Previous studies showed that depression was linked to both alcohol use (Kuria et al., 2012) and NMPDU (Zullig and Divin, 2012).

NMU of prescription analgesics and that of sedatives/hypnotics were both associated with depression when compared to Non-NMU in this study, consistent with a large body of literature showing that individuals with NMU of sedatives/hypnotics were more likely to have depression or anxiety problems than non-users (Cole and Logan, 2010; Kripke, 2007). However, our results further revealed that the association became non-significant when compared to the group of MUO. It is possible that those with NMUPD might use these medications to self-medicate their psychological discomfort (Khantzian, 1997). Thus, the screening of depression or anxiety symptoms among individuals with NMPDU might be crucial in clinical settings.

4.3. Implications

Our findings have implications for preventive strategies of NMPDU. First, persons with NMU of analgesics need to be screened for problematic alcohol use, and persons with NMU of sedatives/hypnotics screened for illicit drug use. Second, the closely monitoring system of prescription medications through National Health Insurance can help keep the prevalence of NMPDU at a low level. Third, as a large proportion of individuals with NMPDU still reported getting medications without a doctor's prescriptions, future policy should aim at closing the potential loophole that these prescription drugs are sold illegally to clients. We suggest to adopt a system similar to Prescription Drug Monitoring Programs to further monitor how pharmacies give medications to these patients. Pharmacological education is suggested to individuals with NMUPD for adherence to medical instructions, helping them to understand the risks of NMUPD and to address motivations for prescription drug misuse. Lastly, as drug diversion was not measured in this national survey, future direction could be focused on (1) evaluating the scale of drug diversion (i.e., giving one's own prescription medications to others), and (2) public campaigns that advocate the importance of appropriate use of these prescription medications.

4.4. Limitations

Several limitations of this study should be noted. First, given the cross-sectional nature of this survey, no causal-relationship could be established. Second, we defined NMU as self-reported use more than the prescription allowed or without a doctor's prescription, which is less stringent than an interview-based diagnosis of use disorders. Third, the prescription central nervous system medications inquired in this study did not include stimulants for attention-deficit hyperactivity disorder, rendering the past-year prevalence of NMPDU in the population underestimated.

5. Conclusions

In conclusion, this national survey provided empirical estimates of past-year prevalence of NMPDU for analgesics and sedatives/hypnotics in the general population in Taiwan, which could fill in the knowledge gap of Asian epidemiologic data of NMPDU. Robust correlates of NMPDU as revealed in comparing NMU to Non-NMU and MUO, respectively, included young adulthood, tobacco smoking, alcohol drinking, and problematic alcohol use for analgesics, and hard drug use and problematic drug use for sedatives/hypnotics. These findings provide useful information for the development of a more tailored prevention strategies of NMPDU.

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Human participation protection

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by the Research Ethics Committee of the National Taiwan University Hospital (approval number: 201309034RINB). Participants were informed the nature of the study and were guaranteed confidentiality prior to the survey. Afterwards, written informed consent was obtained from all participants.

Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2019.100900.

References

Abrahamsson, T., Hakansson, A., 2015. Nonmedical prescription drug use (NMPDU) in the Swedish general population—correlates of analgesic and sedative use. Subst. Use Misuse 50, 148–155.

Babor, T.F., de la Fuente, J.R., Saunders, J.B., Grant, M., 1992. The Alcohol Use Disorders Identification Test: Guidelines for Use in Primary Health Care (WHO Publication No. 92.4). World Health Organization, Geneva.

Becker, W.C., Sullivan, L.E., Tetrault, J.M., Desai, R.A., Fiellin, D.A., 2008. Non-medical use, abuse and dependence on prescription opioids among U.S. adults: psychiatric, medical and substance use correlates. Drug Alcohol Depend. 94, 38–47.

Boyd, C.J., Teter, C.J., West, B.T., Morales, M., McCabe, S.E., 2009. Non-medical use of prescription analgesics: a three-year national longitudinal study. J. Addict. Dis. 28, 232–242.

Boyd, C.J., Austic, E., Epstein-Ngo, Q., Veliz, P.T., McCabe, S.E., 2015. A prospective study of adolescents' nonmedical use of anxiolytic and sleep medication. Psychol. Addict. Behav. 29, 184–191.

Casati, A., Sedefov, R., Pfeiffer-Gerschel, T., 2012. Misuse of medicines in the European Union: a systematic review of the literature. Eur. Addict. Res. 18, 228–245.

Center for Behavioral Health Statistics and Quality, 2016. 2015 National Survey on Drug Use and Health: Detailed Tables. SAMHSA, Rockville, MD.

Chang, H.Y., Daubresse, M., Kruszewski, S.P., Alexander, G.C., 2014. Prevalence and treatment of pain in EDs in the United States, 2000 to 2010. Am. J. Emerg. Med. 32, 421–431.

Chen, C.-H., Chen, W.J., Cheng, A.T.A., 2005. A new approach to the validity of the alcohol use disorders identification test: stratum-specific likelihood ratios analysis. Alcohol. Clin. Exp. Res. 29, 602–608.

Chen, L.Y., Crum, R.M., Strain, E.C., Martins, S.S., Mojtabai, R., 2015. Patterns of concurrent substance use among adolescent nonmedical ADHD stimulant users. Addict. Behav. 49, 1–6.

Chen, W.J., Wu, S.-C., Tsay, W.-I., Chen, Y.-T., Hsiao, P.-C., Yu, Y.-H., Ting, T.-T., Chen, C.-Y., Tu, Y.-K., et al., 2017. Differences in prevalence, socio-behavioral correlates, and psychosocial distress between club drug and hard drug use in Taiwan: results from the 2014 National Survey of Substance Use. Int. J. Drug Policy 48, 99–107.

Chen, Y.L., Wu, S.C., Chen, Y.T., Hsiao, P.C., Yu, Y.H., Ting, T.T., Chen, C.Y., Tu, Y.K., Huang, J.H., et al., 2019. E-cigarette use in a country with prevalent tobacco smoking: a population-based study in Taiwan. J. Epidemiol. 29, 155–163.

Cheng, T.-M., 2015. Reflections on the 20th anniversary of Taiwan's single-payer national health insurance system. Health Aff. 34, 502–510.

Chien, I.C., Bih, S.H., Chou, Y.J., Lin, C.H., Lee, W.G., Chou, P., 2007. Trends in the use of psychotropic drugs in Taiwan: a population-based national health insurance study, 1997–2004. Psychiatr. Serv. 58, 554–557.

Cocco, K.M., Carey, K.B., 1998. Psychometric properties of the drug abuse screening test in psychiatric outpatients. Psychol. Assess. 10, 408–414.

Cole, J., Logan, T.K., 2010. Nonmedical use of sedative-hypnotics and opiates among rural and urban women with protective orders. J. Addict. Dis. 29, 395–409.

Drug Enforcement Administration, 2011. In: US Department of Justice, D.E.A.D (Ed.), US Department of Justice. Automation of Reports and Consolidated Orders System (ARCOS). VA, Springfield.

Garnier, L.M., Arria, A.M., Caldeira, K.M., Vincent, K.B., O'Grady, K.E., Wish, E.D., 2009. Nonmedical prescription analgesic use and concurrent alcohol consumption among college students. Am. J. Drug Alcohol Abuse 35, 334–338.

Guo, L., Xu, Y., Deng, J., Huang, J., Huang, G., Gao, X., Wu, H., Pan, S., Zhang, W.H., et al., 2016. Association between nonmedical use of prescription drugs and suicidal behavior among adolescents. JAMA Pediatr. 170, 971–978.

Han, B., Compton, W.M., Jones, C.M., Cai, R., 2015. Nonmedical prescription opioid use and use disorders among adults aged 18 through 64 years in the United States, 2003-2013. JAMA 314, 1468–1478.

Havens, J.R., Young, A.M., Havens, C.E., 2011. Nonmedical prescription drug use in a nationally representative sample of adolescents: evidence of greater use among rural adolescents. Arch. Pediatr. Adolesc. Med. 165, 250–255.

Heatherton, T.F., Kozlowski, L.T., Frecker, R.C., Fagerstrom, K.O., 1991. The Fagerstrom test for nicotine dependence: a revision of the Fagerstrom tolerance questionnaire. Br. J. Addict. 86, 1119–1127.

Huang, C.-L., Lin, H.-H., Wang, H.-H., 2008. Evaluating screening performances of the Fagerstrom tolerance questionnaire, the Fagerstrom test for nicotine dependence and the heavy smoking index among Taiwanese male smokers. J. Clin. Nurs. 17, 884–890.

Hughes, A., Williams, M.R., Lipari, R.N., Bose, J., Copello, E.A.P., Kroutil, L.A., 2016. Prescription Drug Use and Misuse in the United States: Results From the 2015 National Survey on Drug Use and Health. NSDUH Data Review.

Johnston, L.D., O'Malley, P.M., Bachman, J.G., Schulenberg, J.E., Miech, R.A., 2016. Monitoring the Future: National Survey Results on Drug Use, 1975–2015. College Students and Adults Ages 19–55 Volume 2 Institute for Social Research, The University of Michigan, Ann Arbor.

Khantzian, E.J., 1997. The self-medication hypothesis of substance use disorders: a

reconsideration and recent applications. Harv. Rev. Psychiatry 4, 231–244.
Kiyoshi, W., Liu, F., Shimane, T., 2013. National Household Survey on Drug Use 2013 in Japan: Research Report. Department of Drug Dependence Research, National Institute of Mental Health.
Kokkevi, A., Fotiou, A., Arapaki, A., Richardson, C., 2008. Prevalence, patterns, and correlates of tranquilizer and sedative use among European adolescents. J. Adolesc. Health 43, 584–592.
Kolodny, A., Courtwright, D.T., Hwang, C.S., Kreiner, P., Eadie, J.L., Clark, T.W., Alexander, G.C., 2015. The prescription opioid and heroin crisis: a public health approach to an epidemic of addiction. Annu. Rev. Public Health 36, 559–574.
Kripke, D.F., 2007. Greater incidence of depression with hypnotic use than with placebo. BMC Psychiatry 7, 42.
Kuehn, B.M., 2007. Opioid prescriptions soar: increase in legitimate use as well as abuse. JAMA 297, 249–251.
Kuria, M.W., Ndetei, D.M., Obot, I.S., Khasakhala, L.I., Bagaka, B.M., Mbugua, M.N., Kamau, J., 2012. The association between alcohol dependence and depression before and after treatment for alcohol dependence. ISRN Psychiatry 2012, 482802.
Martins, S.S., Kim, J.H., Chen, L.-Y., Levin, D., Keyes, K.M., Cerdá, M., Storr, C.L., 2015. Nonmedical prescription drug use among US young adults by educational attainment. Soc. Psychiatry Psychiatr. Epidemiol. 50, 713–724.
McCabe, S.E., 2005. Correlates of nonmedical use of prescription benzodiazepine anxiolytics: results from a national survey of U.S. college students. Drug Alcohol Depend. 79, 53–62.
McCabe, S.E., West, B.T., 2014. Medical and nonmedical use of prescription benzodiazepine anxiolytics among U.S. high school seniors. Addict. Behav. 39, 959–964.
McCabe, S.E., Cranford, J.A., Boyd, C.J., 2006. The relationship between past-year drinking behaviors and nonmedical use of prescription drugs: prevalence of co-occurrence in a national sample. Drug Alcohol Depend. 84, 281–288.
McCabe, S.E., Boyd, C.J., Young, A., 2007. Medical and nonmedical use of prescription drugs among secondary school students. J. Adolesc. Health 40, 76–83.
McCabe, S.E., West, B.T., Teter, C.J., Boyd, C.J., 2014. Trends in medical use, diversion, and nonmedical use of prescription medications among college students from 2003 to 2013: connecting the dots. Addict. Behav. 39, 1176–1182.
McCabe, S.E., Veliz, P., Boyd, C.J., Schulenberg, J.E., 2017a. Medical and nonmedical use of prescription sedatives and anxiolytics: adolescents' use and substance use disorder symptoms in adulthood. Addict. Behav. 65, 296–301.
McCabe, S.E., Veliz, P., Boyd, C.J., Schulenberg, J.E., 2017b. Medical and nonmedical use of prescription sedatives and anxiolytics: adolescents' use and substance use disorder symptoms in adulthood. Addict. Behav. 65, 296–301.
McCabe, S.E., West, B.T., Veliz, P., McCabe, V.V., Stoddard, S.A., Boyd, C.J., 2017c. Trends in medical and nonmedical use of prescription opioids among US adolescents: 1976–2015. Pediatrics 139.
Novak, S.P., Hakansson, A., Martinez-Raga, J., Reimer, J., Krotki, K., Varughese, S., 2016. Nonmedical use of prescription drugs in the European Union. BMC Psychiatry 16, 274.
Pan, H.-H., Ho, S.-T., Lu, C.-C., Wang, J.-O., Lin, T.-C., Wang, K.-Y., 2013. Trends in the consumption of opioid analgesics in Taiwan from 2002 to 2007: a population-based study. J. Pain Symptom Manag. 45, 272–278.
Paulozzi, L.J., Centers for Disease Control Prevention, 2011. Drug-induced deaths - United States, 2003–2007. MMWR Suppl 60, 60–61.
Radloff, L.S., 1977. The CES-D scale: a self-report depression scale for research in general population. Appl. Psychol. Meas. 1, 385–401.
Saloner, B., Bachhuber, M., Barry, C.L., 2017. Physicians as a source of medications for nonmedical use: comparison of opioid analgesic, stimulant, and sedative use in a national sample. Psychiatr. Serv. 68, 56–62.
Simoni-Wastila, L., Ritter, G., Strickler, G., 2004. Gender and other factors associated with the nonmedical use of abusable prescription drugs. Subst. Use Misuse 39, 1–23.
Skinner, H.A., 1982. The drug abuse screening test. Addict. Behav. 7, 363–371.
Skinner, H.A., 2001. Assessment of Substance Abuse: Drug Abuse Screening Test (DAST). Retrieved January 10, 2016 from Encyclopedia.com: http://www.encyclopedia.com/doc/1G2-3403100068.html.
Tang, D., Li, P., Guo, L., Xu, Y., Gao, X., Deng, J., Huang, J., Huang, G., Wu, H., et al., 2016. The prevalences of and association between nonmedical prescription opioid use and poor sleep among Chinese high school students. Sci. Rep. 6, 30411.
Tominaga, M., Kawakami, N., Ono, Y., Nakane, Y., Nakamura, Y., Tachimori, H., Iwata, N., Uda, H., Nakane, H., et al., 2009. Prevalence and correlates of illicit and non-medical use of psychotropic drugs in Japan: findings from the World Mental Health Japan Survey 2002–2004. Soc. Psychiatry Psychiatr. Epidemiol. 44, 777–783.
United Nations Office on Drugs and Crime, 2011. The Non-medical Use of Prescription Drugs: Policy Direction Issues. United Nations Office on Drug and Crime, Vienna.
Wang, L.-J., Chen, Y.-C., Chen, C.-K., Chou, W.-J., Chou, M.-C., 2014. Trends in anxiolytic-hypnotic use and polypharmacy in Taiwan, 2002–2009: a nationwide, population-based survey. Psychiatr. Serv. 65, 208–214.
Wu, L.T., Blazer, D.G., 2015. Substance use disorders and co-morbidities among Asian Americans and Native Hawaiians/Pacific Islanders. Psychol. Med. 45, 481–494.
Wu, L.T., Woody, G.E., Yang, C., Pan, J.J., Blazer, D.G., 2011. Racial/ethnic variations in substance-related disorders among adolescents in the United States. JAMA Pediatr. 68, 1176–1185.
Wu, S.-I., Tsay, W.-I., Wu, M.-H., 2015. Current controlled drug regulation in Taiwan. Acta Anaesthesiol. Taiwanica 53, 51–54.
Yang, H.-J., Soong, W.-T., Kuo, P.-H., Chang, H.-L., Chen, W.J., 2004. Using the CES-D in a two-phase survey for depressive disorders among nonreferred adolescents in Taipei: a stratum-specific likelihood ratio analysis. J. Affect. Disord. 82, 419–430.
Young, A.M., Glover, N., Havens, J.R., 2012. Nonmedical use of prescription medications among adolescents in the United States: a systematic review. J. Adolesc. Health 51, 6–17.
Yudko, E., Lozhkina, O., Fouts, A., 2007. A comprehensive review of the psychometric properties of the Drug Abuse Screening Test. J. Subst. Abus. Treat. 32, 189–198.
Zullig, K.J., Divin, A.L., 2012. The association between non-medical prescription drug use, depressive symptoms, and suicidality among college students. Addict. Behav. 37, 890–899.