



Prevalence and relationships of dating application usage, cyber-fraud and mental health among emerging adults in Hong Kong

Chee-kit Chan^{a,b,1}, Xin Wang^{a,1}, Xue Yang^{a,c,*}

^a School of Public Health and Primary Care, The Chinese University of Hong Kong, China

^b AIDS Concern, China

^c The Chinese University of Hong Kong Shenzhen Research Institute, Shenzhen, China

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ABSTRACT

This study aimed to investigate the prevalence and relationships of cyber fraud on dating applications and mental health among emerging adults. An online survey was conducted in Hong Kong ($n = 401$). Results showed that 32% of the dating application users encountered cyber-fraud in the last 2 weeks. Users encountering cyber-fraud had significantly poorer mental health than non-victim users and non-users. Education levels, being female, financial loss, and the leakage of private information were positively related to mental health problems of cyber-fraud victims. Education programs and supporting services are warranted to enhance youth's awareness and minimize the detrimental effects caused by cyber fraud.

1. Introduction

Online social dating applications (apps) have become popular for young people to develop and maintain their interpersonal connections nowadays. In Hong Kong, every 4 out of 10 residents used dating apps in 2017, and the prevalence has risen to 46% for millennials (YouGov Staff, 2022). According to the theory of psychosocial development, people aged around 19–40 are undergoing the 6th stage of development: Intimacy versus Isolation. Thus, it is critical to understand how dating apps may influence young people.

Emerging studies have investigated the consequences of using such apps on mental health problems and substance-use behaviours (Choi et al., 2016a, 2016b). Findings on mental health were inconsistent in previous studies, with some linking dating app use to worse mental health (Her and Timmermans, 2021; Holtzhausen et al., 2020), but some show inverse or non-significant associations (Erevik et al., 2020; Holtzhausen et al., 2020; Zervoulis et al., 2020). Moreover, previous studies were predominantly conducted in Western cultures. We identified no research in the Chinese population.

Using dating apps may increase the risk of encountering cyber fraud, which may be a major contributor to negative mental health consequences for users. The common dating apps-related fraud includes romance scams, hijacking, naked chat blackmail, compensated dating

scams, online shopping fraud, credit card fraud, and online investment fraud (Cybercrime – 守網者, 2022). In 2021, more than one in four victims reported that they encountered fraud via social media; in the past five years, people have reported losing a staggering \$1.3 billion to romance scams (Federal Trade Commission, 2022).

Coming across cyber fraud can be a trauma and a source of chronic stress for dating app users. The items lost in cyber-fraud may cause financial stress for the victims. The victims may also worry that their personal information, private photos, or videos will be published by the scammer onto the internet and suffer from cyberbullying. Furthermore, due to the potential stigma toward using dating apps, victims may feel stressful about disclosing their identities as users or victims and seeking help (Judges et al., 2018), which, in turn, may aggravate the adverse effects of cyber fraud on their mental health.

The current study reported the prevalence of cyber-fraud and compared the difference in mental health among cyber-fraud victims, non-victims and non-users of dating apps in Chinese emerging adults in Hong Kong. It also examined cyber-fraud-related risk factors for victims' mental health. We hypothesized that 1) dating app users coming across cyber-fraud would have poorer mental health than users who did not come across cyber-fraud and non-users; 2) financial loss and other types of loss would be risk factors for cyber-fraud victims' mental health.

* Corresponding author. 5/F, JC School of Public Health and Primary Care, Faculty of Medicine, The Chinese University of Hong Kong, China.

E-mail addresses: jasoncck@hotmail.com (C.-k. Chan), xinwang001@cuhk.edu.hk (X. Wang), sherryxueyang@cuhk.edu.hk (X. Yang).

¹ These authors contributed equally to this work.

2. Methods

2.1. Study design and sampling

Through 2 local Non-Governmental Organizations (NGO) Instagram pages, 4 youth volunteer groups, 3 local subsidized secondary schools, and 2 tertiary education institutes, a total of 401 youth aged 18–35 completed an online self-administered structural questionnaire. The participants were requested to sign an informed consent form. The survey was anonymous and took 10–15 min to complete. No incentive was provided to the participants. Ethics approval was obtained from the ethics committee of the Chinese University of Hong Kong (Ref. #008–22).

2.2. Measures

2.2.1. Demographic characteristic

Information on age, gender, education level, relationship status and money for leisure of the participants was collected.

2.2.2. Experience in using dating applications

Participants reported whether and how often they used dating apps in the past year. They were also asked about whether they encountered cyber fraud and which types of items were lost in cyber fraud, including financial loss and personal data loss (full name, telephone number, social media account information, private photos/videos) in the past two weeks.

2.2.3. Mental health status

The Chinese version of the Patient Health Questionnaire (PHQ-9) (Kroenke et al., 2001; Yu et al., 2010) measured depression severity over the past 2 weeks (0 = Not at all, 3 = Nearly every day). The overall scores of the PHQ-9 range from 0 to 27. The cut-off points of 5, 10, 15, and 20 represent the thresholds for mild, moderate, moderately severe, and severe depression, respectively (Cronbach's $\alpha = 0.83$ for PHQ-9). The Chinese version of the Generalized Anxiety Disorder scale (GAD-7) was used to evaluate symptoms of generalized anxiety (Spitzer et al., 2006; Wang et al., 2017). Symptom frequency was reported on a 4-point Likert-type scale ranging from "0=never" to "3=nearly every day". Cut-off points are similar to the PHQ-9 (Cronbach's $\alpha = 0.93$ for GAD-7).

The Chinese version of the Pittsburgh Sleep Quality Index was used to evaluate sleep quality over a 1-month period (0 = Not during the past month, 3 = Three or more times a week) (Liu, 1996). Higher sum scores represent poorer sleep quality. The cut-off points of 5 represent the thresholds for poor quality of sleep. (Cronbach's $\alpha = 0.93$)

2.3. Statistical analyses

Descriptive analyses were conducted. The levels of mental health problems among dating app users with and without encountering cyber-fraud and non-users were compared by the Analysis of Variance (ANOVA) test and post hoc analyses. Stepwise linear regression analyses included all the background factors and items lost during cyber-fraud to identify the significant risk factors of victims' depression, anxiety, and sleep quality, respectively. In the regression analyses, the responses for the variables of the item lost in cyber-fraud were recoded; namely, "suspected" and "yes", were recoded as 1, while the response "no" was recoded as 0.

3. Results

Among 401 participants, 51.15% of the participant were male. The mean age was 25.00 (SD = 4.72). More than half of the participants had bachelor degree or above ($n = 231$, 57.61%), and the majority were in single status ($n = 238$, 59.35%). (Table S1 in supplementary material).

Most of the participants (64.59%) used dating applications in the past year. Eighty-three of them (32%) encountered cyber-fraud in the last 2 weeks.

The levels of mental health problems were significantly different among non-users, users without encountering cyber-fraud, and users encountering cyber-fraud. Post hoc analyses showed that dating app users encountering cyber-fraud had higher levels of depression, anxiety, and poor sleep quality than the non-users and users without encountering cyber-fraud. There was no significant difference between dating app non-users and users without encountering cyber-fraud regarding these mental health statuses (Table 1).

Among the 83 victims, 40% of them had financial losses; 82.4% could settle the financial loss instantly, while the rest could settle the loss in 1–3 months. The most common personal information lost in cyber-fraud included telephone number (78.3%), social media account information (61.4%), and name of school/workplace (51.8%). Comparatively, full name (26.5%), detailed home address (24.1%) and private photos/videos (21.7%) were less likely to be doxed (Table S2 in supplementary material).

Table S3 presents the significant cyber-fraud-related factors of depression, anxiety, and/or sleep quality. Higher education level and the leakage of full name, telephone number, and private photos/videos were significantly and positively associated with depressive symptoms. Being female, having more leisure money, and the leakage of the telephone number and private photos/videos were significantly and positively associated with anxiety symptoms. Being female, having a higher education level, financial loss, and the leakage of full name, and social media account information were significantly and positively associated with poor sleep quality.

4. Discussion

This is the first study to test the prevalence of dating app users and their mental health problems in Chinese emerging adults. The results highlight the high prevalence of dating app users and social connection and killing time as their top motives. In this digital age, such apps help to meet the social needs of young people. However, as many as one-third of dating app users encountered cyber fraud in the last 2 weeks. Most of the victims reported personal information loss, such as telephone number, followed by social media account information and name of school/workplace. As high as 40% of victims had financial losses, and one-fifth lost private photos/videos. It clearly highlights an urgent need to enhance the awareness, knowledge, and skills of internet security and privacy management among dating app users. Safer platforms are also warranted to help young people to meet their needs.

Our data also showed high prevalences of depression (72.29%), anxiety (67.47%), and poor sleep quality (73.49%) among cyber-fraud victims, which were higher than those reported among patients with chronic disease (e.g., cancer and chest pain) (Al Maqballi et al., 2022; Lin et al., 2021; Wang et al., 2022). However, limited to convenience sampling and a small sample size, the prevalence of mental problems may be biased. Further studies with large representative samples are warranted. Interestingly, we did not find a significant difference between non-victim users and non-users in mental health status, but only users encountering cyber-fraud reported significantly more mental health problems and more than half of them suffered from moderate to severe problems. This finding may explain the inconsistent findings in previous studies on the role of dating app use in mental health; namely, the negative experience instead of using dating app itself contributes to the poor mental health of users. Losing contact information and money were also significant factors of mental health problems. Although losing full name and private photos/videos were less often reported, they were significantly related to increased mental health problems. Losing these items may lead to the sense of being out of control, which is a well-documented risk factor for mental health (Brailovskaia and Margraf, 2021). Victims may worry about being identified by their

Table 1

Mental health status among cyber-fraud victims, non-victims and non-users of dating apps in the past 2 weeks (n = 401).

Mental Health Status		Non-users (N = 142)		Users without encountering fraud (N = 176)		Users encountering fraud (N = 83)		p
Depression	Mean (SD)	6.92	(5.44)	6.78	(5.09)	11.86	(8.24)	<0.001
	No	60	42.25%	72	40.91%	23	27.71%	
	Mild	40	28.17%	56	31.82%	12	14.46%	
	Moderate	30	21.13%	34	19.32%	10	12.05%	
	Moderately Severe	6	4.23%	10	5.68%	18	21.69%	
Anxiety	Severe	6	4.23%	4	2.27%	20	24.10%	<0.001
	Mean (SD)	4.86	(4.86)	5.41	(5.07)	9.7	(6.74)	
	No	82	57.75%	94	53.41%	27	32.53%	
	Mild	38	26.76%	50	28.41%	12	14.46%	
	Moderate	10	7.04%	22	12.50%	20	24.10%	
Poor Sleep Quality	Severe	12	8.45%	10	5.68%	24	28.92%	<0.001
	Mean (SD)	5.31	(3.44)	5.43	(3.46)	8.99	(4.87)	
	0–4	76	53.52%	84	47.73%	22	26.51%	
	5–9	44	30.99%	66	37.50%	15	18.07%	
	10–14	22	15.49%	22	12.50%	34	40.96%	
15+	0	0.00%	4	2.27%	12	14.46%		

acquaintance via the lost information, being further blackmailed for money, and having a long-term impact on their future lives. Professional support services should be provided to these victims to help them minimize the loss and psychological impact.

Female victims were more vulnerable to anxiety and sleep problems than males. Potential explanations include female reproductive hormones and perceived social stigma related to sexual behaviors (Pigott, 1999). It is interesting to find that more leisure money and higher education levels increase mental health problems. It may imply that people with higher socio-ecological status are less likely to accept the experience of being defrauded due to the high expectations from themselves and others. They may have more feelings of shame and hesitation to seek help. In-depth interviews are warranted to better understand the experience and concerns of these high-risk groups.

Limited to the cross-sectional design, no causal relationship could be established. While cyber-fraud can harm mental health, people with poor mental health may be more likely to become victims of cyber-fraud. We also did not know how long the impact of cyber-fraud experience on mental health may last. Second, the convenience sampling limited the generalization of the findings. Self-reported measures might induce report bias. The prevalence of using dating applications and encountering cyber fraud and the amount of financial loss might be underestimated. Finally, some potential factors were not investigated (e.g., attitude toward dating apps and social support). Future studies should address these limitations and validate our findings.

CRedit authorship contribution statement

Chee-kit Chan: Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Xin Wang:** Writing – review & editing, Writing – original draft, Conceptualization. **Xue Yang:** Writing – review & editing, Resources, Formal analysis, Data curation, Conceptualization.

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Declaration of Competing interest

The authors have no relevant financial or non-financial interests to disclose.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.psycom.2024.100197>.

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