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# Prevalence and correlates of depression, anxiety and symptoms of stress in vocational college nursing students from Sichuan, China: a cross-sectional study

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**ABSTRACT**

Nursing students from vocational college programs contribute to over 60% of the nursing student population in China. However, there remains a lack of systematic, quantitative studies examining the prevalence of mental health problems in this population. The purpose of this study was to explore the prevalence of depression, anxiety and stress symptoms and associated factors in vocational college nursing students in Sichuan, China. A total of 554 nursing students from vocational colleges participated in this cross-sectional study. Outcomes were measured with the Depression, Anxiety and Stress Scale 21 (DASS 21). Logistic regressions analysis was performed to examine correlates of mental health problems. The prevalence rates of depression, anxiety and stress symptoms among vocational college nursing students in China were 28.7% (95% *CI* 24.9%–32.5%), 41.7% (95% *CI* 37.6%–45.9%) and 20.2% (95% *CI* 16.8%–23.6%). Mental health problems were elevated as compared to a reference population of Chinese college students of all majors. However, only two percent indicated to seek treatment. The most consistent correlates of mental health problems were reduced engagement in physical and other leisure activities, poor sleep quality, experience of negative life events and poor self-perceived mental health.

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Depression; anxiety; stress; epidemiology; vocational college; nursing students

## Introduction

Attending university is a major life transition in which students grow from adolescence to adulthood. During this crucial stage, many students experience tremendous pressure, mainly resulting from economic tension, academic challenges, lifestyle factors and interpersonal

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relationships. Studies have shown that college students' mental health problems are worse than that of people in the same age group who do not attend college, and correspondingly the prevalence of mental disorders, especially depression, anxiety and stress, is higher in this population (Bayram & Bilgel, 2008; Ibrahim, Kelly, Adams, & Glazebrook, 2013; Steptoe, Ardle, Tsuda, & Tanaka, 2007). Lei, Xiao, Liu, & Li (2016) conducted a meta-analysis of 39 studies (n = 32,694) yielding a pooled estimate for the prevalence of depression of 23.8% (95% *CI* 19.9%–28.5%). Estimates for medical students were even higher (Lei et al., 2016; Puthran, Zhang, Tam, & Ho, 2016). Among students of medical professions, nursing students in particular experience stressful occupational lives during nursing education and training and are at a higher risk for depression than students from other health professions due to low professional status, shortage of nurses, high workload and poor working environments (Chen et al., 2015; Chen, Qian, & Ying, 2012; Hiremath et al., 2016; Shikai, Masahiro Shono, & Frcpsych, 2009). After completing one or more years of university study, the prevalence of mild to severe depression, anxiety, and stress in Canadian undergraduate nursing students was, for instance, 33%, 39%, and 38%, respectively (Chernomas & Shapiro, 2013). More recently, Cheung et al. revealed that the prevalence of depression, anxiety and stress in baccalaureate nursing students in Hong Kong was 24.3%, 39%, and 20.0% (Cheung et al., 2016). Although there is a growing number of studies examining the prevalence rates of mental health problems among nursing students, little attention has been paid to vocational college nursing students in China to date.

In China, nursing students attending 3-year vocational colleges form an important pool for the future nursing work force and account for more than 60% of the total number of nursing students (Rodgers, Zhu, & Melia, 2015). These students tend to be between 17 and 24 years of age, are mostly new graduates from high school and unmarried. The majority of them are female and come from only-child families. Thus, the nursing student population is different from that in other countries within which students are more often married and have previous work experience (C. J. Chen et al., 2015; Chernomas & Shapiro, 2013; Cheung et al., 2016). According to the demand-control model, the combination of high physical and psychological job demands with low decision latitude may produce increased study program-related stress negatively affecting the mental health of nursing students (Tuomi, Aimala, & Žvanut, 2016; Urbanetto et al., 2013).

This study aimed to better understand the occurrence and correlates of depression, anxiety and stress symptoms among contemporary nursing students from 3-year vocational colleges in China. The specific aims were to (i) estimate prevalence rates for above mental health problems in the study population, (ii) compare average symptom scores with normative values for Chinese college students, and (iii) identify demographic and behavioral factors associated with the prevalence of depression, anxiety and stress symptoms.

## Materials and methods

### *Study design*

This study employed a cross-sectional survey design.

### Setting and participants

The survey was conducted from November 2015 to April 2016 and utilized a stratified random cluster sampling method. All four vocational nursing colleges from Sichuan province in China participated within which classes stratified by 1st, 2nd, and 3rd grades were randomly selected. Inclusion criteria were being registered as Year 1 to Year 3 full-time nursing student, having no previous history of mental illness as determined by interview, and being mandarin speakers. We excluded individuals if they were currently involved in other mental health related studies or were taking antipsychotic drugs according to their disclosure.

### Ethical considerations

The study was approved by the Management Board of the four participating vocational colleges. The objectives and procedures of the study were explained to the subjects, with emphasis on voluntary participation, anonymity, and confidentiality. All subjects signed a written informed consent form.

### Data collection and procedures

Outcomes were measured with the Chinese Version of the Depression Anxiety Stress Scale 21 (DASS-21). The DASS-21 is a self-reported measure which is frequently used in clinical and non-clinical samples and assesses three dimensions of mental health symptoms with seven items for each of its subscales: depression, anxiety and stress (Lovibond & Lovibond, 1995). Cronbach's alpha of the Chinese version is 0.83, 0.80, and 0.82 for the depression, anxiety, and stress subscale, respectively (Chan et al., 2012; Wang et al., 2016).

Participants were required to appraise the presence of corresponding symptoms over the past week on a 4-point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). Completion of the scale results in scores for each of the three subscales, with higher scores indicating increased severity of symptoms. Subscale scores can be classified into the normal, mild, moderate, severe and extremely severe ranges according to the DASS manual (Lovibond & Lovibond, 1995).

We further assessed social-demographic information including age, gender, being the only child, urban vs. rural place of living before college, presence of religious belief, having a boyfriend/girlfriend and family economic situation (poor vs. good); study related variables including reason for choosing to study nursing (own choice vs. recommendation of parents/relatives), receipt of government benefits, grade, reason for selecting nursing, having a part time job, and having completed clinical practice; health-related behaviors (skiping breakfast, maintaining seven to eight hours sleep three to four times a week, average daily screen time $\geq$ 4 h, regular physical activity, regular exercise, participating in other leisure activities at least twice every week, having experienced significant life events in the past year, having sought specialized help for a mental health problem since enrollment in the nursing college.); and self perceived mental and physical health. All participants were tested in a classroom setting.

### Data analysis

SPSS Version 23.0 (SPSS Inc., Chicago, IL, USA) was used for data analysis. Univariate analysis derived frequencies (n)/percentages (%) and means/standard deviations (*SD*), for categorical and continuous variables. Prevalence rates of depression, anxiety, and stress with 95% confidence intervals are given as the proportion of those classified to have at least mild symptoms. One-sample t-tests were used to compare mean subscale scores of the sample with normative data provided by Xu and associates (Xu, Xi-Yao, Rui, & Yue-Jia, 2010). Uni- and multivariable logistic regression analyses were used to identify predictors of each of the outcome variables. Multivariable logistic regression employed forward selection. Chi-squared tests were used for analyzing the association between severity of symptoms and seeking mental health care. All tests were 2-tailed and the level of statistical significance was set at *P*-value < 0.05.

## Results

A total of 605 nursing students aged between 17 and 24 years were initially approached, and 544 students completed the assessment, yielding a response rate of 89.9%. Reasons for non-response were: being busy with part-time jobs (n = 6); family problems (n = 5); traffic problems (n = 6); sick leave (n = 6); and lack of interest (n = 11). Twenty-seven cases were excluded because of item-level missing data for the outcomes in question.

### Sample description

Table 1 shows descriptive statistics for socio-demographic, study- and health-related behavioral variables, and self-perceived physical and mental health. Only 35.3% of the students selected the nursing specialty because it was their own preference. Nearly 72% of nursing students reported low physical activity and 86.2% spent more than 4 hours per day of screen time. While nearly 21% of the sample reported poor self-perceived mental health, only 2% percent of the sample reported seeking specialized help for mental health problems since enrolling in the study.

### Prevalence of outcomes and correlations between outcomes

Overall, the prevalence rates for mild to extremely severe levels of depression, anxiety and symptoms of stress in this cohort were 28.7% (95% *CI* 24.9%-32.5%), 41.7% (95% *CI* 37.6%-45.9%) and 20.2% (95% *CI* 16.8%-23.6%), respectively. Prevalence rates for severe to extremely severe levels of depression, anxiety and stress were 2.8% (95% *CI* 1.4%-4.1%), 7.5% (95% *CI* 5.3%-9.8%) and 1.8% (95% *CI* 0.7%-3.0%). About 49.8% of the sample had at least mild symptoms (95% *CI* 45.6%-54.0%) and 8.3% showed severe to extremely severe symptoms (95% *CI* 6.0%-10.6%) according to any of the subscales. We also found significant positive correlations between depression, anxiety and stress symptoms (all *P*s < 0.001, two-tailed; $r = 0.613$ for depression and anxiety, $r = 0.644$ for depression and stress, $r = 0.681$ for anxiety and stress).

**Table 1.** Socio-demographic characteristics and health-related behaviors factors of 544 respondents.

| Variables | Descriptive statistic |
|---|---|
| **Demographics** | |
| Age (Mean ± SD) | 20.2 ± 1.2 |
| Gender | |
| Female (n, %) | 530 (97.4) |
| Only child | |
| Yes (n, %) | 163 (30.0) |
| Living place before college | |
| Urban (n, %) | 120 (22.1) |
| Rural (n, %) | 424 (77.9) |
| Religiousness | |
| Yes (n, %) | 44 (8.1) |
| Boyfriend/Girlfriend | |
| Yes (n, %) | 183 (33.6) |
| Family economic situation | |
| Poor (n, %) | 99 (18.2) |
| Good (n, %) | 445 (81.8) |
| **Study-related factors** | |
| Reason for choosing nursing | |
| Own preference (n, %) | 192 (35.3) |
| Recommendation of parents/relatives (n, %) | 352 (64.7) |
| Receipt of government benefits | |
| Yes (n, %) | 44 (8.1) |
| Part-time job | |
| Yes (n, %) | 18 (3.3) |
| Grade | |
| 1st (n, %) | 209 (38.4) |
| 2nd (n, %) | 117 (21.5) |
| 3rd (n, %) | 218 (40.1) |
| Completed clinical practice | |
| Yes (n, %) | 236 (43.4) |
| **Health Behaviors** | |
| Usually skipping breakfast | |
| Yes (n, %) | 73 (13.4) |
| Maintaining 7–8 h sleep 3–4 times a week | |
| Yes (n, %) | 360 (66.2) |
| Average daily screen time≥4 h | |
| Yes (n, %) | 469 (86.2) |
| Physical activity level | |
| Inactive (n, %) | 390 (71.7) |
| Active (n, %) | 154 (28.3) |
| Regular exercise | |
| Yes (n, %) | 115 (21. 1) |
| Leisure activities at least twice a week | |
| Yes (n, %) | 206 (37.9) |
| Significant life events in the past year | |
| Yes (n, %) | 202 (37.1) |
| Sought mental health care since enrollment in college | |
| Yes (n, %) | 11 (2.0) |
| **Subjective Health** | |
| Self-perceived physical health | |
| Poor (n, %) | 182 (33.5) |
| Good (n, %) | 362 (66.5) |
| Self-perceived mental health | |
| Poor (n, %) | 112 (20.6) |
| Good (n, %) | 432 (79.4) |

### Comparison with norms for Chinese college students

The average subscale scores in each dimension were higher than the norms for all Chinese college students. Similarly, the average subscale scores of the female nursing students were increased as compared to the normative values for Chinese female college students. For males depression and stress were increased. All differences apart from anxiety in males were statistically significant at $P < 0.05$. (Table 2).

### Correlates of symptoms prevalence

Table 3 shows the associations between independent variables and depression, anxiety and stress among the respondents. Univariable analysis indicated that depression, anxiety and stress were more prevalent in students who were physical inactive, did not regularly exercise, did not participate in regular leisure activities, spent more than 4 h on the screen every day, and those who reported suboptimal sleep, life events in the past year as well as poor self-perceived physical and mental health (All *P*s < 0.05). Moreover, students who reported financial problems of their family showed a significantly increased prevalence of depression, while students who reported not being religious and those who had not yet completed 8–12 months of clinical practice were significantly more likely to suffer from anxiety.

In the multivariable logistic regression models four variables, i.e. physical activity level, lack of engagement in leisure activities, life events in the past year and self-perceived mental health, consistently emerged as significant correlates of all outcomes (All *P*s < 0.05). Regarding depression, students who reported suboptimal sleep patterns and those who did not perform regular exercise showed a significantly increased prevalence of depression. Similarly, students with sleep problems and lack of regular exercise were also significantly more likely to suffer from stress. Students reporting not being religious in turn had a significantly increased prevalence of anxiety. (Table 3).

### Seeking mental health care and severity of symptoms

Only eleven students sought specialized help for a mental health problem since enrollment in vocational nursing college, of which one had severe anxiety symptoms. Among those students with at least mild symptoms, there was a significant association between the severity of anxiety symptoms and seeking care ($\chi^2 = 8$, $P = 0.04$, Cramer's $V = 0.20$). Still, 40 students with severe to extremely severe anxiety symptoms did not seek mental care. We did not find any statistically significant association between symptom severity for depression and stress and seeking mental health care (depression: $\chi^2 = 2.8$, $P = 0.43$; stress: $\chi^2 = 1.7$, $P = 0.64$).

## Discussion

This is the first study focusing on the prevalence and determinants of depression, anxiety and stress symptoms in nursing students from vocational colleges in Sichuan, China. Previously, similar research conducted in China had been limited to general university students (Found, Cheong, & Duarte, 2012; Li et al., 2016; Lu et al., 2013), mental health of nurses in occupational groups (Cheung, Lee, & Yip, 2016; Cheung & Yip, 2015), and

**Table 2.** Comparison between the sample and normative values for all Chinese college students.

| | Total | | | Males | | | Females | | |
|---|---|---|---|---|---|---|---|---|---|
| Outcomes | Normative n = 1779 | Nursing n = 544 | Mean Difference (95%*CI*) | Normative n = 555 | Nursing n = 14 | Mean Difference (95%*CI*) | Normative n = 1224 | Nursing n = 530 | Mean Difference (95%*CI*) |
| Depression | 2.97 (2.78,3.16) | 6.63 (6.16,7.11) | **3.66 (3.19,4.14)**[b] | 3.53 (3.14,3.92) | 6.71 (4.47,8.96) | **3.18 (0.94,5.43)**[a] | 2.72 (2.51,2.93) | 6.63 (6.14,7.12) | **3.91 (3.42,4.40)**[b] |
| Anxiety | 5.42 (5.19,5.65) | 6.76 (6.32,7.21) | **1.34 (0.90,1.79)**[b] | 5.52 (5.08,5.96) | 7.29 (4.23,10.34) | 1.77 (−1.29,4.82) | 5.37 (5.10,5.64) | 6.75 (6.30,7.20) | **1.38 (0.93,1.83)**[b] |
| Stress | 6.12 (5.86,6.38) | 10.42 (9.90,10.93) | **4.30 (3.78,4.81)**[b] | 6.29 (5.79,6.79) | 12.29 (8.75,15.82) | **6.00 (2.46,9.53)**[a] | 6.05 (5.75,6.35) | 10.37 (9.85,10.88) | **4.32 (3.80,4.83)**[b] |

Data are expressed as mean (95%*CI*). One sample *t*-test; [a] *P* value < 0.01; [b] *P* value < 0.001;

**Table 3.** Uni-variable and multivariable logistic regression models for the prevalence of at least mild symptoms of depression, anxiety and stress.

| | Depression (n = 156) | | Anxiety (n = 227) | | Stress (n = 110) | |
|---|---|---|---|---|---|---|
| Variables | Unadjusted OR | Adjusted OR | Unadjusted OR | Adjusted OR | Unadjusted OR | Adjusted OR |
| Gender (reference: male) | | | | | | |
| Female | 1.01 (0.31–3.25) | | 0.71 (0.25–2.05) | | 0.93 (0.25–3.38) | |
| Age (reference: 17–20 years) | | | | | | |
| 21–24 | 0.97 (0.67–1.42) | | 0.92 (0.65–1.30) | | 0.91 (0.60–1.40) | |
| Only child (reference: no) | | | | | | |
| Yes | 0.68 (0.44–1.03) | | 1.00 (0.69–1.45) | | 0.80 (0.50–1.28) | |
| Living place before college (reference: urban) | | | | | | |
| Rural | 0.83 (0.54–1.29) | | 1.00 (0.67–1.51) | | 0.79 (0.48–1.28) | |
| Religiousness (reference: yes) | | | | | | |
| No | 1.40 (0.68–2.91) | | 2.28 (1.13–4.62)[a] | 2.51 (1.17–5.37)[a] | 1.37 (0.59–3.17) | |
| Grade (reference: 1st) | | | | | | |
| 2nd | 0.92 (0.55–1.53) | | 1.04 (0.66–1.65) | | 0.68 (0.37–1.25) | |
| 3rd | 1.10 (0.73–1.68) | | 0.90 (0.61–1.32) | | 1.06 (0.67–1.68) | |
| Boyfriend/Girlfriend (reference: yes) | | | | | | |
| No | 1.25 (0.84–1.87) | | 1.12 (0.78–1.61) | | 1.11 (0.71–1.74) | |
| Family economic situation (reference: good) | | | | | | |
| Poor | 1.73 (1.09–2.73)[a] | | 1.27 (0.82–1.96) | | 1.43 (0.86–2.39) | |
| Reason for choosing nursing (reference: own preference) | | | | | | |
| Recommendation of parents/relatives | 1.13 (0.76–1.67) | | 0.72 (0.51–1.03) | | 0.67 (0.44–1.03) | |
| Received government benefits (reference: no) | | | | | | |
| Yes | 1.47 (0.77–2.80) | | 1.44 (0.78–2.67) | | 1.02 (0.47–2.18) | |
| Part-time job (reference: no) | | | | | | |
| Yes | 1.25 (0.46–3.40) | | 1.78 (0.69–4.58) | | 1.13 (0.37–3.51) | |
| Completed clinical practice (reference: yes) | | | | | | |
| No | 1.33 (0. 91–1.94) | | 1.73 (1.22–2.45)[b] | | 1.03 (0.68–1.58) | |
| Skip breakfast (reference: no) | | | | | | |
| Yes | 0.93 (0.54–1.61) | | 1.11 (0.67–1.82) | | 1.23 (0.69–2.22) | |
| Good sleep (reference: yes) | | | | | | |
| No | 1.55 (1.06–2.28)[a] | 1.60 (1.02–2.52)[a] | 1.46 (1.02–2.09)[a] | | 1.78 (1.16–2.73)[b] | 1.66 (1.04–2.67)[a] |
| Average daily screen time≥4 h (reference: no) | | | | | | |
| Yes | 2.09 (1.12–3.93)[a] | | 1.74 (1.03–2.94)[a] | | 2.33 (1.08–5.00)[a] | |

(*Continued*)

**Table 3.** (Continued).

| Variables | Depression (n = 156) | | Anxiety (n = 227) | | Stress (n = 110) | |
|---|---|---|---|---|---|---|
| | Unadjusted OR | Adjusted OR | Unadjusted OR | Adjusted OR | Unadjusted OR | Adjusted OR |
| Physical activity level (reference: active) | | | | | | |
| Inactive | 2.95 (1.81–4.81)[c] | 2.63 (1.54–4.51)[c] | 5.24 (3.29–8.34)[c] | 5.38 (3.33–8.70)[c] | 3.97 (2.11–7.47)[c] | 3.55 (1.84–6.87)[c] |
| Regular exercise (reference: yes) | | | | | | |
| No | 9.77 (4.19–22.75)[c] | 12.14 (4.93–29.91)[c] | 1.60 (1.04–2.46)[a] | | 2.29 (1.23–4.26)[b] | 2.16 (1.11–4.20)[a] |
| Regular engagement in leisure activity (reference: yes) | | | | | | |
| No | 3.08 (2.10–4.52)[c] | 3.16 (2.04–4.89)[c] | 2.31 (1.62–3.29)[c] | 2.13 (1.45–3.13)[c] | 2.86 (1.86–4.39)[c] | 2.55 (1.61–4.05)[c] |
| Life events in the past year (reference: no) | | | | | | |
| Yes | 2.05 (1.40–3.00)[c] | 2.04 (1.32–3.16)[c] | 1.71 (1.21–2.44)[b] | 1.69 (1.15–2.49)[b] | 1.95 (1.28–2.98)[b] | 1.75 (1.10–2.79)[a] |
| Self-perceived physical health (reference: good) | | | | | | |
| Poor | 2.17 (1.48–3.18)[c] | | 1.84 (1.28–2.64)[b] | | 1.82 (1.19–2.79)[b] | |
| Self-perceived mental health (reference: good) | | | | | | |
| Poor | 3.85 (2.49–5.94)[c] | 3.70 (2.24–6.12)[c] | 2.10 (1.38–3.20)[c] | 1.97 (1.24–3.14)[b] | 4.01 (2.53–6.35)[c] | 3.47 (2.10–5.72)[c] |

Data are expressed as *OR* (95%*CI*). [a] *P* value < 0.05; [b] *P* value < 0.01; [c] *P* value < 0.001.

solely focused on single aspects of mental health, such as depression. (Lu et al., 2013; Xu et al., 2014).

In the present study, we found high prevalence rates of mild to extremely severe levels of depression, anxiety and stress among students of vocational nursing colleges. Tensions arising from the study burden in conjunction with financial burdens, relationship problems, and adjustment to college life together produce a potential source of stress and may lead to an increased risk of mental illness in this population. The psychological status of nursing students not only contributes to the trend of Chinese nursing graduates leaving the clinical nursing career, further increasing the shortage of nurses, but also affects the quality of future clinical nursing and patient satisfaction (Peng, 2009; Zhang, 2011; Zhu, Rodgers, & Melia, 2015).

While prevalence rates found in our study are comparable to those from baccalaureate nursing students from Hong Kong (Cheung et al., 2016), the found prevalence of depression alone was nearly 2.5 times higher than that reported in a recent large-scale epidemiological study among general Chinese college students (Lu et al., 2013). The reasons may be related to requirements associated with studying nursing in China. Nursing students face heavy academic and psychological pressures related to skill examinations and clinical practice in the field. Compared to nursing students who had already completed their mandatory 6–8 months of clinical practice, those who had not yet completed clinical practice were significantly more likely to suffer anxiety in our unadjusted analysis. Although this variable was no longer statistically significant in multivariable regression, it has some practical significance: the shortage of clinical nurses and the resulting need for nursing students to shoulder a bulk of the nursing work load may produce anxiety in the students who are insecure if they can live up to the high clinical practice expectations of their programs.

In turn, we found no evidence that the pathway of choosing the nursing specialty plays a role in the development of mental health problems as had been previously suggested (Zhu et al., 2015). While our study showed that only one third of the students chose to study nursing based on their own preference, this was not associated with the prevalence of any of the mental health problems evaluated in the present investigation.

The most consistent correlates of mental health problems in our study were instead low physical activity and lack of exercise, lack of engagement in leisure activity, having experienced negative life events in the past year, suboptimal sleep patterns and poor self-perceived mental health. These results are mostly in line with those of previous studies of college students. College students who joined regular exercise programs were shown to have lower anxiety and depression in studies by Kim et al. and Hamidah, Santoso, & Karyono (2015) and Kim, Cohen, Oh, & Sok (2004). Engagement in leisure activities can have a healing and protective effect on mental well-being by promoting relaxation, arousing positive emotions, mobilizing social support and reducing stress (Leckey, 2011; Parisi et al., 2014). On the other hand, screen time – a factor significantly contributing to increased symptom prevalence in unadjusted analysis – may influence health by displacing time that could otherwise have been used for physical or other leisure activity (Melkevik, Torsheim, Iannotti, & Wold, 2010). Poor sleep is highly prevalent among college students and is associated with poor mental health, poor quality of life and decreased academic performance (Alimirzae, Azzizadeh, Abazari, & Haghdoost, 2014; Feng, Zhang, Du,

Ye, & He, 2013; Wu, Tao, Zhang, Zhang, & Tao, 2015). Our findings regarding a strong association between symptoms prevalence and self-perceived mental health not only confirm previous research (Chen et al., 2015; Cheung et al., 2016; Xu et al., 2014), but show that students seem to be aware of their problems. On the other hand, however vocational nursing students rarely sought specialized help for psychological symptoms, even if those symptoms were severe. Potential reasons may be that many nursing students with psychiatric symptoms thought of them as normal experiences that every student has and accordingly did not perceive a need for professional help. As a consequence, students may underestimate the seriousness of their symptoms and leave them untreated or instead deal with issues themselves or by consulting friends. In addition, students may be unfamiliar with mental health care and related concepts such as psychological counseling and not know where to get services or distrust mental health professionals. Reluctance to seek mental health care may moreover arise from a fear of stigma and discrimination which in turn may cause additional distress. Alternatively, hesitation to seek care may be explained by cultural differences between Eastern and Western cultures. Adolescents and youth in China tend to be more passive and less outspoken as compared to those in western countries (Chen et al., 2015; Xu et al., 2010). Future research is warranted to identify barriers to seeking help for mental health problems in order to design strategies to promote emotional health and well-being among nursing students.

Our study has several limitations. First, the cross-sectional design prevented us to differentiate between causes and effects of mental health problems. Sleeping problems and physical activity levels for instance are likely to have a more complex, reciprocal relationship with mental health symptoms. Second, owing to the small number of male participants in this study, we were limited in analyzing differences according to sex and generalizability to male nursing students is restricted. Third, the DASS-21 is a screening instrument and there was no clinical confirmation of diagnoses. Fourth, collinearity of variables, e.g. screen time and physical activity, may have prevented predictors to reach statistical significance in adjusted analysis. Fifth, other relevant outcomes potentially related to the experience of mental health problems such as clinical and academic performance or willingness to continue education were not studied. Future research needs to expand the present design towards longitudinal studies of nursing students at different levels, including future job perspectives. Moreover, intervention strategies to reduce the mental health burden for nursing students need to be designed and evaluated.

## Conclusions

Our study demonstrated a high prevalence of mental health problems among vocational nursing students in Sichuan, China, while only few were seeking help for those problems. It thus has important implications for health promotion and mental disease prevention among nursing students.

It is of utmost importance to improve the mental health status of nursing students in vocational colleges by considering relevant risk factors and applying appropriate strategies for intervention. The development of appropriate strategies and sufficient support

can help vocational nursing students alleviate psychological distress and adapt to the health care environment without losing their vision of nursing for the future.

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## References

Alimirzae, R., Forouzi, M. A., Abazari, F., & Haghdoost, A. A. (2014). Prevalence of quality of sleeping and its determinants among Students of Kerman Razi School of nursing and midwifery. *Asian Journal of Nursing Education & Research*, *4*(1), 76–80.

Bayram, N., & Bilgel, N. (2008). The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. *Social Psychiatry and Psychiatric Epidemiology*, *43*(8), 667–672. Retrieved from https://<GotoISI>://WOS:000259363900011http://download.springer.com/static/pdf/634/art%253A10.1007%252Fs00127-008-0345-x.pdf?originUrl=http%3A%2F%2Flink.springer.com%2Farticle%2F10.1007%2Fs00127-008-0345-x&token2=exp=1474383259~acl=%2Fstatic%2Fpdf%2F634%2Fart%25253A10.1007%25252Fs00127-008-0345-x.pdf%3ForiginUrl%3Dhttp%253A%252F%252Flink.springer.com%252Farticle%252F10.1007%252Fs00127-008-0345-x*~hmac=d9dc9718983692395f233394bfce9fde6e62cdf68c92bd35a4cb5de8d40fbb9c

Chan, R. C., Xu, T., Huang, J., Wang, Y., Zhao, Q., Shum, D. H., … Potangaroa, R. (2012). Extending the utility of the depression anxiety stress scale by examining its psychometric properties in Chinese settings. *Psychiatry Research*, *200*(2–3), 879–883. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/22921506

Chen, C. J., Chen, Y. C., Sung, H. C., Hsieh, T. C., Lee, M. S., & Chang, C. Y. (2015). The prevalence and related factors of depressive symptoms among junior college nursing students: A cross-sectional study. *Journal of Psychiatric and Mental Health Nursing*, *22*(8), 590–598. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/26149070http://onlinelibrary.wiley.com/store/10.1111/jpm.12252/asset/jpm12252.pdf?v=1&t=itbl1lzj&s=7863a3c0e7a50e19431c850b48e582d026d548b7

Chen, J., Qian, L. U., & Ying, S. Y. (2012). Professional identity, job stress, job satisfaction and turnover intention among nurses. *Chinese Nursing Management, 12*(6), 43–46.

Chernomas, W. M., & Shapiro, C. (2013). Stress, depression, and anxiety among undergraduate nursing students. *International Journal of Nursing Education Scholarship*, *10*(1), 255–266. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/24200536

Cheung, T., Lee, P. H., & Yip, P. S. F. (2016). Suicidality among Hong Kong nurses: Prevalence and correlates. *Journal of Advanced Nursing*, *72*(4), 836–848. Retrieved from http://onlinelibrary.wiley.com/store/10.1111/jan.12869/asset/jan12869.pdf?v=1&t=iwizq3nc&s=c022889621dfd033e9e2a223a505e32cf94ad342

Cheung, T., Wong, S., Wong, K., Law, L., Ng, K., Tong, M., … Yip, P. (2016). Depression, anxiety and symptoms of stress among baccalaureate nursing students in Hong Kong: A

cross-sectional study. *International Journal of Environmental Research and Public Health*, *13* (8), 779.

Cheung, T., & Yip, P. S. (2015). Depression, anxiety and symptoms of stress among Hong Kong nurses: A cross-sectional study. *International Journal of Environmental Research and Public Health*, *12*(9), 11072–11100.

Feng, Q., Zhang, Q., Du, Y., Ye, Y., & He, Q. (2013). Associations of physical activity, screen time with depression, anxiety and sleep quality among Chinese college freshmen. *PloS one*, *9*(6), e100914–e100914.

Found, A., Cheong, H. I., & Duarte, C. (2012). Negative affect among undergraduates: Why are higher levels reported by Asian students? *Asia-Pacific Psychiatry*, *4*(3), 210–218.

Hamidah, Z., Santoso, P. T., & Karyono, R. H. (2015). Effect of regular exercise on anxiety and self-esteem level in college students. *Althea Medical Journal*, *2*(3), 429–432.

Hiremath, P., Mohite, V. R., Naregal, P., Pawar, S., Mulik, A., Katti, A., & Bhosale, T. (2016). Depression, anxiety and stress among newly admitted undergraduate nursing student at Krishna Institute of Nursing Sciences Karad. *International Journal of Health Sciences & Research*, *6*(6), 233–237. Retrieved from http://www.scopemed.org/?mno=232035

Ibrahim, A. K., Kelly, S. J., Adams, C. E., & Glazebrook, C. (2013). A systematic review of studies of depression prevalence in university students. *Journal of Psychiatric Research*, *47*(3), 391–400. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/23260171

Kim, K. B., Cohen, S. M., Oh, H. K., & Sok, S. R. (2004). The effects of meridian exercise on anxiety, depression, and self-esteem of female college students in Korea. *Holistic Nursing Practice*, *18*(5), 230–234. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/15497601. http://ovidsp.tx.ovid.com/ovftpdfs/FPDDNCGCJGDFHI00/fs046/ovft/live/gv023/00004650/00004650-200409000-00004.pdf

Leckey, J. (2011). The therapeutic effectiveness of creative activities on mental well-being: A systematic review of the literature. *Journal of Psychiatric and Mental Health Nursing*, *18* (6), 501–509. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/21749556http://onlinelibrary.wiley.com/store/10.1111/j.1365-2850.2011.01693.x/asset/j.1365-2850.2011.01693.x.pdf?v=1&t=itbl9aw5&s=80e7b3828bdd30147ce9c27be10f662e496f374b

Lei, X. Y., Xiao, L. M., Liu, Y. N., & Li, Y. M. (2016). Prevalence of depression among Chinese University students: A meta-analysis. *PloS one*, *11*(4), e0153454. Retrieved from >Go to ISI>://360WOS:000373900700071.http://journals.plos.org/plosone/article/asset?id=10.1371/journal.pone.0153454.PDF

Li, W., Meng, X., Xu, Z., Yu, Q., Shi, J., Yu, Y., … Kou, C. (2016). Prevalence, correlates of major depression: A mental health survey among undergraduates at a mainland Chinese university. *Asia-Pacific Psychiatry*, *8*(3), 206–214.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the beck depression and anxiety inventories. *Behaviour Research and Therapy*, *33*(3), 335–343. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/7726811

Lu, C., Lin, W., Xiao, H. Q., Xiu, X. Y., Zheng, X. Q., Yan, J. Y., & Yuan, L. (2013). Correction: Depression among Chinese University students: Prevalence and socio-demographic correlates. *PloS one*, *8*(3), 462–469.

Melkevik, O., Torsheim, T., Iannotti, R. J., & Wold, B. (2010). Is spending time in screen-based sedentary behaviors associated with less physical activity: A cross national investigation. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(3), 232–238. Retrieved from <Go to ISI>://WOS:000279903400001 http://download.springer.com/static/pdf/748/art%253A10.1186%252F1479-5868-7-46.pdf?originUrl=http%3A%2F%2Fijbnpa.biomedcentral.com%2Farticle%2F10.1186%2F1479-5868-7-46&token2=exp=1474382794~acl=%2Fstatic%2Fpdf%2F748%2Fart%25253A10.1186%25252F1479-5868-7-46.pdf*~hmac=9927691a4123551918fd8c764c802219e9371f1a17f5c86101a86f56490de56c

Parisi, J. M., Xia, J., Spira, A. P., Xue, Q. L., Rieger, M. L., Rebok, G. W., & Carlson, M. C. (2014). The association between lifestyle activities and late-life depressive symptoms. *Activities Adaptation & Aging*, *38*(38), 1–10.

Peng, X. L. (2009). Turnover intention and its related factors in undergraduate intern nurses. *Chinese Mental Health Journal*, *23*(8), 603–606.

Puthran, R., Zhang, M. W. B., Tam, W. W., & Ho, R. C. (2016). Prevalence of depression amongst medical students: A meta-analysis. *Medical Education*, *50*(4), 456–468. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/26995484

Rodgers, S., Zhu, J., & Melia, K. (2015). Can education resolve nursing shortage in China? [Article]. *Athens Journal of Health*, *2*(3), 177–190.

Shikai, N., Masahiro Shono, M. D., & Frcpsych, T. K. (2009). Effects of coping styles and stressful life events on depression and anxiety in Japanese nursing students: A longitudinal study. *International Journal of Nursing Practice*, *15*(3), 198–204. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/19531078

Steptoe, A., Ardle, J., Tsuda, A., & Tanaka, Y. (2007). Depressive symptoms, socio-economic background, sense of control, and cultural factors in university students from 23 countries. *International Journal of Behavioral Medicine*, *14*(2), 97–107. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/17926438

Tuomi, J., Aimala, A. M., & Žvanut, B. (2016). Nursing students' well-being using the job-demand-control model: A longitudinal study. *Nurse Education Today*, *45*(p), 193.

Urbanetto, J. D. S., Maciel, V. O., Santanna, V. M., Gustavo, A. D. S., Polidefigueiredo, C. E., Urbanetto, J. D. S., & Maciel, V. O. (2013). Work-related stress according to the demand-control model and minor psychic disorders in nursing workers. *Revista Da Escola De Enfermagem Da Usp*, *47*(5), 1180–1186.

Wang, K, Shi, H. S, Geng, F. L, Zou, L. Q, Tan, S. P, Wang, Y, & Chan, R. C. (2016). Cross-cultural validation of the Depression Anxiety stress scale-21 in China. *Psychological Assessment*, *28*(5), e88-e100. doi: 10.1037/pas0000207

Wu, X. Y., Tao, S. M., Zhang, Y. K., Zhang, S. C., & Tao, F. B. (2015). Low physical activity and high screen time can increase the risks of mental health problems and poor sleep quality among Chinese college students. *PloS one*, *10*(3), e0119607. Retrieved from >Go to ISI>://WOS:000352138500118

Xu, G., Xi-Yao, X., Rui, X., & Yue-Jia, L. (2010). Psychometric properties of the Chinese Versions of DASS-21 in Chinese college students. *Chinese Journal of Clinical Psychology*, *18*(04), 443–446.

Xu, Y., Chi, X., Chen, S., Qi, J., Zhang, P., & Yang, Y. (2014). Prevalence and correlates of depression among college nursing students in China. *Nurse Education Today*, *34*(6), e7–e12. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/24268639

Zhang, X. Q. (2011). Current Nursing shortage and its solutions in China. *Macau Journal of Nursing*, *10*(2), 36–38.

Zhu, J., Rodgers, S., & Melia, K. M. (2015). Can education resolve nursing shortage in China?. *Athens Journal of Health*, *2*(3), 177–190.