**Title**: Insomnia identity and its correlates in adolescents

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**Abstract**

*Objective*: Insomnia identity refers to the conviction that one has insomnia; however, uncoupling between poor sleep and insomnia identity is common with more than one-quarter of community-dwelling adults are noncomplaining poor sleepers (NP) or complaining good sleepers (CG). The present study aimed to examine the proportions of complaining poor sleepers (CP), NP, CG and noncomplaining good sleepers (NG) among adolescents and the characteristics of those who endorsed insomnia identity.

*Methods*: This is a school-based survey of 1521 adolescents. Sociodemographic, lifestyle, sleep and daytime characteristics were examined. Insomnia identity was defined as a complaint of insomnia 3-7 nights per week, while 4 definitions of poor sleep based on frequency and severity of difficulty initiating sleep (DIS), difficulty maintaining sleep (DMS) and early morning awakening (EMA) and subjective sleep quality were employed.

*Results*: Students had a mean age of 14.5 years; 55.5% were female. The proportion of poor sleepers ranged from 9.5% to 22.1% and the ratio between CP and NP ranged from 1/3.3 to 1/7.0. Using the lowest threshold definition of poor sleep, the distributions of CP, NP, CG, and NG were 2.8%, 19.4%, 0.3%, and 77.6%, respectively. Multivariate logistic regression showed that DIS, DMS and EMA scores and sleep satisfaction score were independent predictors of insomnia identity.

*Conclusion*: NP are common among adolescents. Although NP have less severe sleep and daytime symptoms compared to CP, their sleep disturbance is of sufficient severity and

frequency that warrants attention. A name change for insomnia is proposed for effective communication.

**Keywords**: Adolescents; Sleep disturbance; Insomnia; Insomnia identity; Name change

## 1. Introduction

Insomnia is one of the most common sleep problems during adolescence. A recent review of large-scale surveys on adolescent sleep patterns and problems found that the prevalence of difficulty initiating sleep (DIS) ranged from 7% to 36%, with a mean of 16% [1]. Insomnia is associated with reduced quality of life and behavioral and emotional problems in adolescents, such as depression, suicidality, eating disorder, alcohol and substance abuse, risk-taking behavior, interpersonal problem, and worse academic performance [2-6]. Despite the high prevalence of insomnia and its significant health risk, help-seeking for insomnia among adolescents is uncommon [7,8]. There are many potential barriers to help-seeking, but a related issue is whether adolescents with poor sleep recognize themselves as having insomnia. Labeling oneself an insomniac or having insomnia creates an insomnia identity [9], but the use of correct labels has significant implications on an individual's psychological well-being and help-seeking behavior. From the literature on adolescents with mental health problems, fear of labels or anticipation of stigma is a common barrier to help-seeking and mental health service utilization [10]. Adolescents maybe vulnerable to the negative impacts of stigmatizing labels due to their need for sense of competence, social acceptance, and autonomy [11]. Among adolescents who were receiving mental health services, Moses showed that only 20% self-labeled to have a diagnosis (e.g., 'bipolar problem', 'ADD or ADHD'), condition (e.g., 'very emotionally depressed'), or addiction (e.g., 'marijuana problems') [12]. Insomnia may be viewed as a mild form of mental health problem among adolescents. There are limited data on how common and

under what situations adolescents with poor sleep consider themselves an insomniacs or having insomnia. From the literature in adults, the relationship between poor sleep and insomnia identity is complex and uncoupling between poor sleep and insomnia identity is common.

Pooled data from 2 studies in community-dwelling adults showed that 17% were noncomplaining poor sleepers (NP) and 11% were complaining good sleepers (CG), which are regarded as uncoupled sleepers, while complaining poor sleepers (CP) and noncomplaining good sleepers (NG) accounted for 19% and 54%, respectively [9,13,14]. The ratio between CP and NP was approximately 1:1, meaning that around 50% of poor sleepers did not regard themselves an insomniac or having insomnia. In these studies, poor sleep was defined according to quantitative criteria of sleep onset latency or wake after sleep onset ≥ 31 min, ≥ 3 times a week, and for ≥ 6 months. Nevertheless, there is no consensus of the exact approach for discriminating between good versus poor sleep. The definition of poor sleep may influence whether an individual adopts an insomnia identity. Other factors that may increase the chance of an individual to endorse an insomnia identity include older age, female gender, history of transient insomnia episodes, low socioeconomic status, medical/psychiatric comorbidity, unrealistic and idiosyncratic sleep expectations, nonrestorative sleep, impaired daytime functioning, and personality bias [9]. To our knowledge, limited studies have investigated the proportion of adolescents with poor sleep who endorse an insomnia identity. The correlates of insomnia identity among adolescents are largely unknown. The aim of the present study was to examine the proportions of CP, NP, CG and NG among adolescents with regard to different definitions of poor sleep. We also examined

the sociodemographic, lifestyle, sleep, and daytime characteristics of adolescents who endorsed an insomnia identity. The findings have important implications in the diagnosis and treatment of insomnia in adolescents.

## 2. Methods

### 2.1. Participants

Data of the present study were obtained from a published, validation study of three self-report questionnaires for the assessment and screening of insomnia in adolescents [15]. We pre-selected 3 schools with different levels of academic achievement and conducted the survey among all 7th-10th and 12th grade students at each school. Eleventh-grade students were preparing for public examination during the study period, so they were not recruited. Students and their parents had to provide written informed consent. The response rate at the 3 schools was 63.0%, 65.0%, and 82.6%, and the overall response rate was 71.7%.

### 2.2. Procedure

Questionnaires were distributed to the students in their classrooms by the investigators with the help of teachers. Students completed the questionnaire on their own with no time limit. All procedures used in the present study were reviewed and approved by the local institutional review board.

### 2.3. Measures

The questionnaires were presented sequentially in the order of sociodemographic characteristics, academic performance, Sleep Quality Index (SQI) [16], Insomnia Severity Index (ISI) [17], Athens Insomnia Scale (AIS) [18], Epworth Sleepiness Scale (ESS) [19], 12-item General Health Questionnaire (GHQ-12) [20], daytime napping, Internet use, and alcohol and smoking habits.

The SQI has 8 items and was first developed in Finland as a tool to examine sleep quality. Participants reported how often they have difficulty falling asleep, waking up during the night, waking up too early in the morning, disturbed night sleep, and insomnia with response categories: no, < 3 nights/week, and 3-7 nights/week. Time to fall asleep was reported with responses: ≤ 10 min, 11-30 min, and > 30 min. Frequency of hypnotics use was assessed using response categories: no, occasionally, and at least once per week. Morning tiredness was reported as 'rather or very alert', 'don't know', and 'rather or very tired'. Higher SQI scores indicate more severe sleep disturbance. The Cronbach's alpha of the Chinese version of SQI was 0.65 and the 2-week test-retest reliability was 0.72. The Chinese SQI had satisfactory correlation with general mental health and daytime sleepiness [15].

The ISI is a 7-item scale assessing the perceived severity of insomnia symptoms (initial, middle, terminal), the degree of satisfaction with sleep, interference with daytime functioning, noticeability of impairment, and concern caused by the sleep problem. The scale is Likert-type with five anchor points ranging from 0 (not at all) to 4 (very severe) according to the perceived degree of severity and from 0 (very satisfied, not at all interfering, not at all noticeable, and not

at all worried) to 4 (very dissatisfied, very much interfering, very much noticeable, and very much worried) according to the level of distress and impairment caused by the sleep problem. The Chinese version of ISI had satisfactory internal consistency (Cronbach's alpha = 0.83), test-retest reliability (Pearson's r = 0.79) and concurrent validity [15].

The AIS was designed to assess the severity of insomnia based on the ICD-10 diagnostic criteria. It consists of 8 items; the first 5 items assess difficulty with sleep induction, awakening during the night, early morning awakening, total sleep time, and overall quality of sleep, while the last 3 items pertain to the sense of well-being, overall functioning and sleepiness during the day. Each item can be rated 0-3, with 0 corresponding to no problem at all and 3 to very serious problem. The Chinese version of AIS had satisfactory internal consistency (Cronbach's alpha = 0.81), test-retest reliability (Pearson's r = 0.80) and concurrent validity [15].

The ESS is an 8-item questionnaire to assess the average daytime sleep propensity. It focus on tendency to sleepiness with a 3-point scale to rate the likelihood of dozing in eight daily life situations. A study in adolescents found that the test-retest reliability of ESS over 2 weeks was high [21]. The Chinese version of ESS had satisfactory internal consistency (Cronbach's alpha = 0.80), test-retest reliability (Spearman's r = 0.72) and concurrent validity [22].

The GHQ-12 has been extensively used in different cultures for the assessment of psychological well-being in adults and adolescents [23]. It consists of six positive and six negative statements. Subjects were asked to rate their responses using a 4-point Likert scale ('less than usual' to 'much more than usual'). Each question was sored using a binary code (0, 0,

1, 1) with total score ranging from 0 to 12. Higher scores indicate greater psychological distress. The Chinese version of GHQ-12 has been widely used in different populations [24].

We asked students to report their school performance as excellent, good, or marginal based on their rank in class, average mark, or overall grade. The students also filled out their age, gender, previous consultation for sleep problems, number and duration of napping per week, habit of smoking and the number of cigarettes smoked per day, frequency of alcohol use using the response categories ‘never’, ‘rarely’, ‘sometimes’, ‘almost always’, and ‘often’, amount of time spent on the Internet, and parents’ marital status, occupation, and educational level. Presence of drinking habit refers to ‘sometimes’, ‘almost always’, and ‘often’ in alcohol use.

2.4. Presence of insomnia identity

Students who reported that they had insomnia 3-7 nights per week were considered to have insomnia identity.

2.5. Presence of poor sleep

As an exploratory study, four different definitions of poor sleep based on the items and response categories of SQI, ISI and AIS were used. The first definition was based on SQI items, which use frequency as response categories; poor sleep was present when DIS, difficulty maintaining sleep (DMS) or early morning awakening (EMA) occurred 3-7 nights per week. The second definition was based on ISI items, which use severity as response categories; poor sleep was present when DIS, DMS or EMA was rated as ‘severe’ or ‘very severe’. The third definition was based on the AIS item on sleep quality; poor sleep was present when overall quality of sleep

was rated as ‘markedly unsatisfactory’ or ‘very unsatisfactory’. The fourth definition of poor sleep was met when students fulfilled one of the 3 criteria.

2.6. Predictors of insomnia identity

Sociodemographic variables included students’ age and gender and their parents’ marital status, educational level, and occupation. Lifestyle variables included students’ smoking and drinking habits and the amounts of time spent on the Internet and daytime napping. Sleep variables included SQI DIS, DMS and EMA items’ score which was based on frequency (range = 0-6), ISI DIS, DMS and EMA items’ score which was based on severity (range = 0-12), AIS sleep quality item score (range = 0-3), ISI sleep satisfaction item score (range = 0-4), and AIS total sleep time item score (range = 0-3). The five sleep variables were chosen to cover the key aspects of sleep disturbance. Daytime variables included ISI distress and impairment items’ score (range = 0-12), AIS daytime impairment items’ score (range = 0-9), ESS and GHQ-12. Academic performance was also included as a potential correlate of insomnia identity.

2.7. Statistical analysis

Variables were expressed in mean ± SD or number (%). Analysis of variance (ANOVA), independent *t*, and chi-square tests were used for between-group comparisons. When there was significant between-group difference by ANOVA, bonferroni post-hoc test was used. Univariate and multivariate logistic regression were used to assess the predictors of insomnia identity. Variables with significant bivariate relationships with insomnia identity were included in the multivariable logistic model, using a simple ‘enter’ method. The final model was assessed using

the Hosmer-Lemeshow test for goodness of fit, of which $p > 0.05$ means that the model fitted the data well. Odds ratios (ORs) and their 95% confidence interval (CI) were calculated. Multicollinearity with the independent variables was investigated using the variance inflation factor (VIF) and tolerance statistic. A VIF < 10 and a tolerance statistic > 0.1 were suggestive of a lack of multicollinearity. All statistical analyses were conducted using SPSS version 24.

## 3. Results

Of the 1521 students who returned questionnaires, 5 students were excluded due to their age ≤ 11 years or ≥ 20 years (0.3%) and 67 students were excluded due to missing data on items that were required for the definition of insomnia identity and poor sleep (4.4%), and the number of students included in the analysis was 1447.

### 3.1. Percent distributions of CP, NP, CG, and NG

The proportion of poor sleepers ranged from 9.5% to 22.1% (Table 1) and the proportion of NP among poor sleepers ranged from 76.6% to 87.5%. The ratio between CP and NP increased from 1/3.3 to 1/7.0 when the threshold for defining poor sleep was reduced. Using the lowest threshold definition of poor sleep, the percent distributions of CP, NP, CG, and NG were 2.8%, 19.4%, 0.3%, and 77.6%, respectively. Uncoupled sleepers (NP + CG) represented a fifth of the sample (19.6%), but the majority were NP (19.4%) and very few were CG (0.3%).

### 3.2. Difference in sociodemographic, lifestyle, sleep and daytime characteristics between CP, NP, CG and NG

Table 2 presents the characteristics of the sample. Students had a mean age of 14.5 years (SD = 1.5, range = 12-19 years); 55.5% ($n$ = 802) were female, most participants were grade 7-10 students, and only 3.0% were grade 12 students. There was a significant difference between CP, NP, CG and NG in age, parents' educational level, smoking and drinking habits, the amount of time spent on the Internet and daytime napping, and all sleep and daytime variables. Pairwise comparison revealed that CP had more disturbances in sleep and daytime functioning and a higher proportion of smokers and drinkers, compared to NP and NG. A significantly greater proportion of the mothers of CP had secondary or higher level of education (80.6%), compared to NP (70.0%) and NG (72.5%), while a greater proportion of the fathers of NG had secondary or higher level of education (75.4%), compared to CP (69.7%) and NP (68.8%). The comparison between CG and other groups was limited by the small number of CG ($n$ = 4).

### 3.3. Difference in sociodemographic, lifestyle, sleep and daytime characteristics between insomniac and non-insomniac

Table 3 presents the difference between insomniacs (CP + CG) and non-insomniacs (NP + NG). Insomniacs had significantly more severe sleep disturbance and daytime impairment and were more common to have smoking and drinking habits.

### 3.4. Logistic regression predicting insomnia identity

The independent predictors of insomnia identity were SQI DIS, DMS and EMA items' score (OR = 2.12, $p$ = 0.0001), ISI sleep satisfaction item score (OR = 1.92, $p$ = 0.02), and ISI DIS, DMS and EMA items' score (OR = 1.22, $p$ = 0.048). The model had a -2 log likelihood of

220.73 and Hosmer-Lemeshow test $p = 0.99$, meaning that the model fitted the data well. VIF ranged from 1.03 to 2.29, while tolerance statistic ranged from 0.43 to 0.97, suggestive of a lack of multicollinearity between the variables included in multivariate logistic regression.

## 4. Discussion

The major finding was that between 76.6% to 87.5% of adolescents with poor sleep did not complain of having insomnia. The ratio of complaining and noncomplaining poor sleepers varied from 1:3.3 to 1:7.0. Adolescents with insomnia complaint had poorer sleep, greater distress and daytime impairment, and a greater chance of smoking and drinking than those with no insomnia complaint. Upon logistic regression, labelling oneself having insomnia was associated with poorer sleep, while daytime difficulties and lifestyle factors were no longer significant predictors.

The proportion of CP, NP, CG and NG in adolescents was somewhat different from that in adults [9,13,14]. Firstly, only 0.3% of adolescents were CG, while 11% of CG was found among adults. Secondly, CP and NP were roughly equal in proportion in adults, but NP was far more common than CP among adolescents with a 3.3 to 7.0-fold difference. Our finding suggests that labelling oneself as an insomniac is uncommon among adolescents, especially for good sleepers, possibly due to the stigma that is associated with insomnia; however there have been no studies examining how adolescents perceive and react toward their sleep problems. Another difference between adults and adolescents was the severity of daytime symptoms between groups. Previous

studies in adults showed that daytime symptoms were less severe in those with no insomnia complaint whether or not they had poor sleep (NP and NG) compared to insomniacs (CP and CG), with CG having the highest level of anxiety, depression, and fatigue, followed by CP and NG, while NP having the lowest level. Our finding in adolescents found that CP had the highest level of distress and most severe emotional and behavioral problems, followed by NP, while the least impaired was NG. The difference in findings suggests that insomnia identity has different characteristics in adults and adolescents. Among adults, insomnia identity, but not poor sleep, is related to daytime symptoms; for adolescents, insomnia identity and poor sleep have an additive effect on the severity of daytime symptoms. Our finding suggests that insomnia identity in adolescents lies on a continuum with increasing severity of poor sleep, impaired daytime functioning, and behavioral problems from NG to NP and finally to CP.

When nighttime, daytime, and behavioral symptoms were taken into account by regression analysis, only nighttime symptoms were predictors of insomnia identity. Among the nighttime symptoms, frequency and severity of DIS, DMS and EMA and degree of sleep dissatisfaction, but not sleep duration and sleep quality, were independent predictors. Our finding suggests that DIS, DMS, EMA and sleep dissatisfaction may belong to the concept of insomnia in adolescents, while sleep duration and sleep quality may have different meanings (e.g., inadequate opportunity for sleep and disturbed sleep due to environmental factors). In adults with insomnia, daytime symptoms play more important roles in determining help-seeking and quality of life than nighttime symptoms [25,26], implying that the negative impact of daytime symptoms can be

greater than that of nighttime symptoms. However, we found that nighttime symptoms were more important in determining whether adolescents regarded themselves having insomnia than daytime symptoms, suggesting that the relative importance of nighttime and daytime symptoms may differ between adults and adolescents. Further studies are needed to examine the roles of nighttime and daytime symptoms and insomnia identity in determining help-seeking and quality of life among adolescents.

One of the major limitations of the current study is the definition of insomnia identity. We have not directly asked the students whether they label themselves as an insomniac or having insomnia, but 'insomnia 3-7 nights per week' is probably compatible with self-labeling of insomnia. Our definition of poor sleep is different from previous studies in adults; hence the comparison of our findings with those found in adults should be treated with caution.

## 5. Conclusion

Noncomplaining poor sleepers are common among adolescents. Only 1 in 3 to 1 in 7 poor sleepers in our sample endorsed having insomnia. Although we found that noncomplaining poor sleepers had less severe sleep and daytime symptoms compared to complaining poor sleepers, their sleep disturbance was of suffienct severity and frequency that warranted attention and treatment. There may be positive and negative aspects for the lack of self-labeling among noncomplaining poor sleepers, but an important issue is how to engage them and foster improvements. A lack of understanding of the health risks of insomnia, a tendency to trivialize

sleep problem, a concern about labelling, difficulties in help-seeking, and the stigma that is associated with insomnia are important topics during promotion about sleep health. There are strong historical and cultural contexts about insomnia, ranging from acclamation to devaluation [27]. Experience from the name change of schizophrenia suggests that both healthcare professionals and patients are more willing to use a less pejorative name for diagnosis and that the new name is important for psychoeducation and stigma reduction programs [28]. It may be time to consider a new name for insomnia, such as sleep inefficiency, to highlight that people with insomnia are not as severe as sleeplessness and that treatments are aimed to improve their sleep efficiency. Lastly, when taking a sleep history or talking about sleep with adolescents, it may be better to ask whether they are dissatisfied with their sleep or have DIS, DMS and EMA, instead of asking whether they have insomnia, which is likely resulted in under-diagnosis.

**Conflict of interest**

The authors declare that they have no conflict of interest.

**Table 1**. Distribution of complaining poor sleepers (CP), noncomplaining poor sleepers (NP), complaining good sleepers (CG), and noncomplaining good sleepers (NG) based on different definitions of poor sleep ($n$ = 1447)

| | CP | NP | CG | NG | CP+NP (poor sleepers) | NP+CG (uncoupled sleepers) | NP/ CP+NP | CP/NP |
|---|---|---|---|---|---|---|---|---|
| DIS, DMS, EMA ≥ 3 nights/wk | 33 (2.3) | 127 (8.8) | 11 (0.8) | 1276 (88.2) | 160 (11.1) | 138 (9.5) | 127/160 (79.4) | 33/127 (1/3.8) |
| DIS, DMS, or EMA severe or very severe | 32 (2.2) | 105 (7.3) | 12 (0.8) | 1298 (89.7) | 137 (9.5) | 117 (8.1) | 105/137 (76.6) | 32/105 (1/3.3) |
| SQ markedly or very unsatisfactory | 24 (1.7) | 163 (11.3) | 20 (1.4) | 1240 (85.7) | 187 (12.9) | 183 (12.7) | 163/187 (87.2) | 24/163 (1/6.8) |
| Meet at least one | 40 (2.8) | 280 (19.4) | 4 (0.3) | 1123 (77.6) | 320 (22.1) | 284 (19.6) | 280/320 (87.5) | 40/280 (1/7.0) |

Data are presented as $n$ (%).
DIS, difficulty initiating sleep; DMS, difficulty maintaining sleep; EMA, early morning awakening; SQ, sleep quality.

**Table 2**. Sociodemographic, lifestyle, sleep and daytime characteristics by sleep types

| | All participants (*n* = 1447)[a] | CP (*n* = 40) | NP (*n* = 280) | CG (n = 4) | NG (*n* = 1123) | $F/\chi^2$ | *p* value |
|---|---|---|---|---|---|---|---|
| Age, yr | 14.54±1.51 | 14.55±1.41[b] | 14.80±1.64 | 13.00±1.41 | 14.48±1.47[b] | 4.73 | 0.003 |
| 12-13 | 393 (27.3) | 9 (22.5) | 72 (25.7) | 3 (75.0) | 309 (27.7) | 26.80 | 0.008 |
| 14 | 338 (23.5) | 9 (22.5) | 54 (19.3) | 0 (0) | 275 (24.7) | | |
| 15 | 331 (23.0) | 12 (30.0) | 62 (22.1) | 1 (25.0) | 256 (23.0) | | |
| 16 | 233 (16.2) | 8 (20.0) | 45 (16.1) | 0 (0) | 180 (16.2) | | |
| 17-19 | 143 (9.9) | 2 (5.0) | 47 (16.8) | 0 (0) | 94 (8.4) | | |
| Female gender | 802 (55.5) | 22 (55.0) | 157 (56.1) | 1 (25.0) | 622 (55.4) | 1.55 | 0.67 |
| Grade | | | | | | 7.38 | 0.83 |
| 7 | 315 (21.8) | 7 (17.5) | 57 (20.4) | 2 (50.0) | 249 (22.2) | | |
| 8 | 396 (27.4) | 12 (30.0) | 72 (25.7) | 2 (50.0) | 310 (27.6) | | |
| 9 | 284 (19.6) | 8 (20.0) | 53 (18.9) | 0 (0) | 223 (19.9) | | |
| 10 | 408 (28.2) | 12 (30.0) | 87 (31.1) | 0 (0) | 309 (27.5) | | |
| 12 | 44 (3.0) | 1 (2.5) | 11 (3.9) | 0 (0) | 32 (2.8) | | |
| Parents' marital status | | | | | | 3.90 | 0.69 |
| Single | 40 (2.8) | 2 (5.0) | 9 (3.2) | 0 (0) | 29 (2.7) | | |
| Married/cohabiting | 1226 (86.6) | 35 (87.5) | 233 (83.8) | 4 (100.0) | 954 (87.2) | | |
| Divorced/widowed | 150 (10.6) | 3 (7.5) | 36 (12.9) | 0 (0) | 111 (10.1) | | |
| Father's education | | | | | | 23.87 | 0.001 |
| College or above | 51 (4.6) | 2 (6.1) | 7 (3.3) | 2 (50.0) | 40 (4.7) | | |
| Secondary | 761 (69.4) | 21 (63.6) | 141 (65.6) | 2 (50.0) | 597 (70.7) | | |
| Primary or below | 285 (26.0) | 10 (30.3) | 67 (31.2) | 0 (0) | 208 (24.6) | | |
| Mother's education | | | | | | 31.53 | 0.0001 |
| College or above | 34 (3.1) | 1 (3.2) | 7 (3.3) | 2 (50.0) | 24 (2.8) | | |
| Secondary | 756 (69.2) | 24 (77.4) | 142 (66.7) | 2 (50.0) | 588 (69.7) | | |
| Primary or below | 302 (27.7) | 6 (19.4) | 64 (30.0) | 0 (00 | 232 (27.5) | | |
| Father's occupation | | | | | | 16.84 | 0.33 |
| Managers, administrators and professionals | 155 (12.0) | 5 (13.5) | 27 (10.7) | 1 (25.0) | 122 (12.2) | | |
| Associate professionals, clerks and service workers | 110 (8.5) | 3 (8.1) | 19 (7.5) | 2 (50.0) | 86 (8.6) | | |
| Skilled and semi-skilled workers | 678 (52.6) | 16 (43.2) | 132 (52.5) | 0 (0) | 530 (53.2) | | |
| Unskilled manual workers | 136 (10.5) | 4 (10.8) | 28 (11.1) | 0 (0) | 104 (10.4) | | |
| Unemployed/homemakers | 93 (7.2) | 4 (10.8) | 21 (8.3) | 0 (0) | 68 (6.8) | | |
| Retired/others | 118 (9.1) | 5 (13.5) | 26 (10.3) | 1 (25.0) | 86 (8.6) | | |
| Mother's occupation | | | | | | 16.06 | 0.38 |
| Managers, administrators and professionals | 65 (4.8) | 2 (5.6) | 14 (5.3) | 1 (25.0) | 48 (4.6) | | |
| Associate professionals, clerks and service workers | 286 (21.3) | 9 (25.0) | 56 (21.4) | 2 (50.0) | 219 (21.1) | | |
| Skilled and semi-skilled workers | 64 (4.8) | 0 (0) | 16 (6.1) | 0 (0) | 48 (4.6) | | |
| Unskilled manual workers | 156 (11.6) | 6 (16.7) | 39 (14.9) | 0 (0) | 111 (10.7) | | |
| Unemployed/homemakers | 744 (55.4) | 19 (52.8) | 132 (50.4) | 1 (25.0) | 592 (56.9) | | |
| Retired/others | 27 (2.0) | 0 (0) | 5 (1.9) | 0 (0) | 22 (2.1) | | |
| Self-reported academic performance | | | | | | 10.01 | 0.12 |
| Excellent | 406 (28.2) | 9 (23.1) | 68 (24.4) | 2 (50.0) | 327 (29.2) | | |
| Good | 596 (41.3) | 13 (33.3) | 111 (39.8) | 1 (25.0) | 471 (42.1) | | |
| Marginal | 440 (30.5) | 17 (43.6) | 100 (35.8) | 1 (25.0) | 322 (28.8) | | |
| Had smoking habit | 23 (1.6) | 3 (7.5) | 7 (2.5) | 0 (0) | 13 (1.2) | 11.57 | 0.009 |
| Alcohol use | 217 (15.2) | 17 (42.5) | 56 (20.2) | 2 (50.0) | 142 (12.8) | 37.06 | 0.0001 |
| Daytime napping, hr/wk | 2.64±4.01 | 3.98±4.79 | 3.35±4.76[b] | 0.44±0.38 | 2.42±3.74[b] | 5.96 | 0.0001 |
| Internet use, hr/wk | 3.60±2.40 | 3.73±3.11 | 3.98±2.73[b] | 4.50±4.04 | 3.49±2.27[b] | 3.27 | 0.02 |
| SQI DIS, DMS and EMA score | 1.25±1.22 | 3.38±1.64[b,c] | 2.28±1.27[b] | 1.75±0.96[c] | 0.92±0.93[b] | 188.55 | 0.0001 |
| ISI DIS, DMS and EMA | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| score | 2.12±2.18 | 5.98±2.59[b,c] | 3.99±2.48[b] | 2.25±1.50[c] | 1.51±1.61[b] | 195.02 | 0.0001 |
| ISI sleep satisfaction score | 1.72±1.09 | 2.88±0.91[b] | 2.39±1.03[b] | 2.00±0.82 | 1.51±1.02[b] | 73.42 | 0.0001 |
| AIS total sleep time score | 0.89±0.76 | 1.80±0.69[b] | 1.42±0.83[b] | 1.25±0.96 | 0.73±0.66[b] | 96.64 | 0.0001 |
| AIS sleep quality score | 0.70±0.73 | 1.70±0.79[b] | 1.51±0.82[c] | 0.50±0.58[b,c] | 0.47±0.50[b,c] | 274.92 | 0.0001 |
| ISI distress and impairment score | 3.56±2.40 | 6.38±2.45[b] | 5.42±2.54[b] | 5.50±0.58 | 2.99±2.03[b] | 119.96 | 0.0001 |
| AIS daytime impairment score | 2.55±1.82 | 4.78±1.72[b] | 3.78±2.06[b] | 4.67±1.53 | 2.15±1.54[b] | 98.79 | 0.0001 |
| ESS | 7.76±4.02 | 10.25±3.99[b] | 9.67±4.30[c] | 5.67±6.03 | 7.21±3.77[b,c] | 33.42 | 0.0001 |
| GHQ-12 | 2.17±2.82 | 5.18±3.69[b] | 3.88±3.30[b] | 1.25±1.89 | 1.64±2.39[b] | 70.73 | 0.0001 |

[a] Data are presented as mean±SD or *n* (%). Difference from total *n* reflects omission on reporting forms. [b,c] Same letter means significant post-hoc difference.

AIS, Athens Insomnia Scale; CG, complaining good sleepers; CP, complaining poor sleepers; DIS, difficulty initiating sleep; DMS, difficulty maintaining sleep; EMA, early morning awakening; ESS, Epworth Sleepiness Scale; GHQ-12, 12-item General Health Questionnaire; ISI, Insomnia Severity Index; NG, noncomplaining good sleepers; NP, noncomplaining poor sleepers; SQI, Sleep Quality Index.

**Table 3**. Sociodemographic, lifestyle, sleep and daytime characteristics by insomnia identity

| | Insomniac ($n$ = 44)[a] | Non-insomniac ($n$ = 1403) | $t/\chi^2$ | $p$ value |
|---|---|---|---|---|
| Age, yr | 14.41±1.47 | 14.54±1.51 | 0.58 | 0.56 |
| 12-13 | 12 (27.3) | 381 (27.3) | 2.46 | 0.65 |
| 14 | 9 (20.5) | 329 (23.6) | | |
| 15 | 13 (29.5) | 318 (22.8) | | |
| 16 | 8 (18.2) | 225 (16.1) | | |
| 17-19 | 2 (4.5) | 141 (10.1) | | |
| Female gender | 23 (52.3) | 779 (55.6) | 0.19 | 0.67 |
| Grade | | | 0.52 | 0.97 |
| 7 | 9 (20.5) | 306 (21.8) | | |
| 8 | 14 (31.8) | 382 (27.2) | | |
| 9 | 8 (18.2) | 276 (19.7) | | |
| 10 | 12 (27.3) | 396 (28.2) | | |
| 12 | 1 (2.3) | 43 (3.1) | | |
| Parents' marital status | | | 1.11 | 0.57 |
| Single | 2 (4.5) | 38 (2.8) | | |
| Married/cohabiting | 39 (86.6) | 1187 (86.5) | | |
| Divorced/widowed | 3 (6.8) | 147 (10.7) | | |
| Father's education | | | 3.43 | 0.18 |
| College or above | 4 (10.8) | 47 (4.4) | | |
| Secondary | 23 (62.2) | 738 (69.6) | | |
| Primary or below | 10 (27.0) | 275 (25.9) | | |
| Mother's education | | | 5.04 | 0.08 |
| College or above | 3 (8.6) | 31 (2.9) | | |
| Secondary | 26 (74.3) | 730 (69.1) | | |
| Primary or below | 6 (17.1) | 296 (28.0) | | |
| Father's occupation | | | 4.19 | 0.52 |
| Managers, administrators and professionals | 6 (14.6) | 149 (11.9) | | |
| Associate professionals, clerks and service workers | 5 (12.2) | 105 (8.4) | | |
| Skilled and semi-skilled workers | 16 (39.0) | 662 (53.0) | | |
| Unskilled manual workers | 4 (9.8) | 132 (10.6) | | |
| Unemployed/homemakers | 4 (9.8) | 89 (7.1) | | |
| Retired/others | 6 (14.6) | 112 (9.0) | | |
| Mother's occupation | | | 4.76 | 0.45 |
| Managers, administrators and professionals | 3 (7.5) | 62 (4.8) | | |
| Associate professionals, clerks and service workers | 11 (27.5) | 275 (21.1) | | |
| Skilled and semi-skilled workers | 0 (0) | 64 (4.9) | | |
| Unskilled manual workers | 6 (15.0) | 150 (11.5) | | |
| Unemployed/homemakers | 20 (50.0) | 724 (55.6) | | |
| Retired/others | 0 (0) | 27 (2.1) | | |
| Self-reported academic performance | | | 2.80 | 0.25 |
| Excellent | 11 (25.6) | 395 (28.2) | | |
| Good | 14 (32.6) | 582 (41.6) | | |
| Marginal | 18 (41.9) | 422 (30.2) | | |
| Had smoking habit | 3 (6.8) | 20 (1.4) | 7.76 | 0.005 |
| Alcohol use | 19 (43.2) | 198 (14.3) | 27.56 | 0.0001 |
| Daytime napping, hr/wk | 3.65±4.67 | 2.60±3.98 | 1.69 | 0.09 |
| Internet use, hr/wk | 3.80±3.15 | 3.59±2.38 | 0.57 | 0.57 |
| SQI DIS, DMS and EMA score | 3.23±1.65 | 1.19±1.15 | 11.41 | 0.0001 |
| ISI DIS, DMS and EMA score | 5.64±2.72 | 2.01±2.07 | 11.33 | 0.0001 |
| ISI sleep satisfaction score | 2.80±0.93 | 1.68±1.08 | 6.76 | 0.0001 |

| | | | | |
|---|---|---|---|---|
| AIS total sleep time score | 1.75±0.72 | 0.86±0.75 | 7.74 | 0.0001 |
| AIS sleep quality score | 1.59±0.84 | 0.68±0.71 | 8.34 | 0.0001 |
| ISI distress and impairment score | 6.30±2.35 | 3.47±2.35 | 7.85 | 0.0001 |
| AIS daytime impairment score | 4.77±1.69 | 2.48±1.78 | 8.33 | 0.0001 |
| ESS | 9.90±4.25 | 7.70±4.00 | 3.37 | 0.001 |
| GHQ-12 | 4.82±3.72 | 2.09±2.75 | 6.41 | 0.0001 |

[a] Data are presented as mean±SD or *n* (%). Difference from total *n* reflects omission on reporting forms.
AIS, Athens Insomnia Scale; DIS, difficulty initiating sleep; DMS, difficulty maintaining sleep; EMA, early morning awakening; ESS, Epworth Sleepiness Scale; GHQ-12, 12-item General Health Questionnaire; ISI, Insomnia Severity Index; SQI, Sleep Quality Index.

**Table 4**. Factors associated with insomnia identity

| | Univariate logistic regression | | | Multivariate logistic regression | | |
|---|---|---|---|---|---|---|
| Variables | *β* | OR (95% CI) | *p* value | *β* | OR (95% CI) | *p* value |
| Smoking | 1.61 | 4.99 (1.43-17.45) | 0.01 | 1.42 | 0.24 (0.04-1.47) | 0.12 |
| Alcohol use [a] | 1.52 | 4.55 (2.46-8.42) | 0.0001 | 0.78 | 0.46 (0.20-1.04) | 0.06 |
| SQI DIS, DMS and EMA score | 1.08 | 2.94 (2.32-3.73) | 0.0001 | 0.75 | 2.12 (1.46-3.07) | 0.0001 |
| ISI DIS, DMS and EMA score | 0.54 | 1.72 (1.52-1.94) | 0.0001 | 0.20 | 1.22 (1.002-1.50) | 0.048 |
| ISI sleep satisfaction score | 1.07 | 2.90 (2.08-4.06) | 0.0001 | 0.65 | 1.92 (1.10-3.36) | 0.02 |
| AIS sleep quality score | 1.37 | 3.92 (2.72-5.63) | 0.0001 | -0.34 | 0.71 (0.37-1.39) | 0.32 |
| AIS total sleep time score | 1.38 | 3.99 (2.71-5.87) | 0.0001 | 0.60 | 1.81 (0.93-3.55) | 0.08 |
| ISI distress and impairment score | 0.40 | 1.49 (1.33-1.66) | 0.0001 | -0.11 | 0.90 (0.71-1.13) | 0.34 |
| AIS daytime impairment score | 0.54 | 1.71 (1.48-1.98) | 0.0001 | 0.28 | 1.33 (0.99-1.79) | 0.06 |
| ESS | 0.13 | 1.14 (1.05-1.23) | 0.001 | -0.05 | 0.95 (0.86-10.6) | 0.34 |
| GHQ-12 | 0.24 | 1.27 (1.17-1.37) | 0.0001 | -0.05 | 0.96 (0.83-1.10) | 0.51 |

[a] Often, almost always or sometimes.

AIS, Athens Insomnia Scale; DIS, difficulty initiating sleep; DMS, difficulty maintaining sleep; EMA, early morning awakening; ESS, Epworth Sleepiness Scale; GHQ-12, 12-item General Health Questionnaire; ISI, Insomnia Severity Index; SQI, Sleep Quality Index.

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