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Original Article

Effects of the COVID-19 pandemic on emotional and behavioral problems and sleep problems in adolescents

Bernie Endyarni Medise, Maulana Okta Reza, Yoga Devaera, Amanda Soebadi, Novie Amelia Chozie, Antonius H. Pudjiadi

Abstract

Background The asynchrony rapid phase of cognitive, physical and emotional development occurring in adolescence may result in various issues such as risk-taking behavior, psychosocial and emotional problems. School closure during the COVID-19 pandemic has caused a tremendous change in adolescent lifestyle and habits, including sleep patterns. causing added challenges to adolescents' emotional and behavioral problems.

Objective To identify the association between sleep disorders with emotional and behavioral problems during the COVID-19 pandemic in urban and rural adolescents.

Methods We conducted a cross-sectional study among adolescents aged 12-18 years from November to December 2021 in two provinces, DKI Jakarta and Riau Islands. We recruited students consecutively from randomly selected junior and senior high schools. We used the *Strengths and Difficulties Questionnaire* (SDQ) and the *Pittsburgh Sleep Quality Index* (PSQI) to screen for emotional and behavioral problems and for sleep disorders, respectively. The questionnaires were sent electronically to each subject after obtaining parental consent.

Results There were 400 subjects included in our study, of which 64% were female. The prevalences of COVID-19 amongst subjects in urban and rural areas were COVID-19 12.5% and 5.5%, respectively. Emotional and behavioral disorders as well as sleep disorders were more common in rural than urban areas (13 *vs.* 11.5% and 50.5% *vs.* 38%; P=0.012, respectively). Sleep disorders were associated with the SDQ subscales of emotional symptoms [PR 4.88 (95%CI 2.97 to 8.03); P<0.01), conduct problems [PR 3.71 (95%CI 1.53 to 9.04); P=0.02), hyperactivity/inattention [PR 6.05 (95%CI 2.58 to 16.17); P<0.01], and peer relationship problems [PR 3.28 (95%CI 1.33 to 8.09); P<0.01).

Conclusion Sleep disorders among adolescents during COVID-19 pandemic were associated with emotional and behavioral problems. Adolescents who live in rural areas were more likely to have sleep disorders, emotional and behavioral problems. **[Paediatr Indones. 2023;63:383-8; DOI: https://doi.org/10.14238/pi63.5.2023.383-8**].

Keywords: *adolescents; emotional and behavioral problems; COVID-19 pandemic; sleep disorders*

Adolescence is a transition period from childhood into adulthood. During this period, adolescents develop their self-identity and independence, which, in parallel, integrates with biological, emotional, and psychosocial factors. The second rapid phase of brain development happens during adolescence, accompanied by hormonal changes linked to asynchrony between cognitive, emotional, and self-control abilities. These conditions may lead to emotional and behavioral problems, a prominent issue among children and adolescents.[1,2] These emotional and behavioral problems or disorders can be classified into internalizing (such as anxiety, depression) or externalizing (such as disruptive behaviors). Data in the United States from 2005 to 2011 showed that approximately 4.6% of children and adolescents aged 3-17 years experienced a disruptive behavioral disorder (6.2% in boys *vs.* 3.0% in girls), anxiety (4.7%), depression (3.9%), and autism spectrum disorder

From the Department of Child Health, Faculty of Medicine, Universitas Indonesia/Dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia.

Corresponding author: Bernie Endyarni Medise. Department of Child Health, Faculty of Medicine, Universitas Indonesia/Dr. Cipto Mangunkusumo General Hospital. Jalan Diponegoro No. 71, Jakarta Pusat 10430, Indonesia. Email address: bernie.medise@yahoo.com.

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(1.1%).[1] In Indonesia, based on the *Riset Kesehatan Dasar 2018* (*2018 Basic Health Research Survey*), the prevalence of mental health and emotional problems among the15 to 24-year-old groups reached 10% and that of emotional problems was slightly higher in rural than urban areas (10% *vs*. 9.8%).[3] A study on adolescents in junior high schools aged 12-15 years revealed that 14.5% adolescent students experienced mental health problems.[1,4]

Another challenging issue in adolescents is sleep disorders. This condition may affect quantity and quality of sleep, nighttime awakening, and difficulty falling asleep. In a 2016 study on Indonesian school-age children, the prevalence of sleep disorders ranged from 25% to 40%.[5] A study in Sulawesi Tenggara province showed that 78.1% of teenage girls had sleep disorders, especially during the COVID-19 pandemic.[6] Poor sleep among children may result in growth and development problems as well as emotional and behavioral issues. Factors that affect the quality and quantity of sleep pattern in adolescents include biological (age, hormonal issue, circadian rhythm) and non-biological factors (environment, noise, food and beverages).[6-8]

This study aimed to identify the association between sleep disorders and emotional and behavioral problems in urban and rural adolescents during the COVID-19 pandemic.

Methods

We conducted a cross-sectional study in adolescents aged 12-18 years during the COVID-19 pandemic, from November to December 2021. The study was done in the Jakarta Capital Region, an urban area, and Riau Islands province, a predominantly rural area. We randomly selected junior and senior high schools in the region and consecutively recruited students attending selected schools using until the minimum sample size was obtained. Subjects were students attending the selected junior and high schools who gave assent to participate in the study and obtained parental informed consent. Students were excluded when they had chronic diseases, mental disorders (such as autism spectrum disorder, intellectual disability), or incomplete questionnaires. Online questionnaires were sent electronically to each student after parental informed consent was obtained.

The minimum required sample size was calculated using the sample size formulae for estimation of single proportion and for hypothesis testing of the difference between two proportion, with alpha of 0.05 and power of 80%. We found a minimum required sample size of 408 subjects.

We used the 25-item *Strengths and Difficulties Questionnaire* (SDQ) which involved positive and negative scores to screen for psychosocial, emotional, and behavioral problems among adolescents. The SDQ consisted of five scales containing five items each: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior. The first four scales would be added to generate a total difficulties score (20 items).[9]

The 19-item *Pittsburgh Sleep Quality Index* (PSQI) was used to screen for sleep disorders. The questionnaire consisted of 19 self-reported items in a combination of Likert-scale and open-ended questions, consisting of seven subcategories: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Scores for each question range from 0 to 3, with higher scores indicating more acute sleep problems.[10]

We analyzed the association between sleep disorders and the presence of emotional and behavioral problems in each of the SDQ scales using the chi-square test. Data analysis was done using *SPSS version 27* (*IBM*, Armonk, New York). We expressed numerical data as medians and ranges and categorical data as proportions. Risk was expressed as prevalence ratio (PR) with 95% confidence interval (95%CI). A P value of 0.05 was considered statistically significant. The study protocol has been approved by the Health Research Ethics Committee of Universitas Indonesia/ Dr. Cipto Mangunkusumo Hospital.

Results

There were 469 students who were eligible for this study. Sixty-nine students were excluded due to having chronic diseases, mental disorders, or incomplete questionnaires. We finally obtained 400 subjects, consisting of 200 subjects from each province. Demographic characteristics of subjects are described

in **Table 1**. Most subjects (64%) were female. Subjects ranged in age from 12 to 18 years, with a median age of 15 years.

There was a higher prevalence of COVID-19 among subjects in urban (12.5%) than in rural areas (5.5%). Subjects in rural areas had a higher rate of

Table 1. Sociodemographic characteristics of subjects (N=400)

Characteristcs	Urban (n=200)	Rural (n=200)
Gender, n (%)		
Male	79 (39.5)	65 (32.5)
Female	121 (60.5)	135 (67.5)
Median age (range), years	15 (12-18)	15 (12-18)
Median number of family members (range)	4 (2-7)	4 (2-9)
Daily screen time, n (%)		
<2 hours	40 (20.0)	55 (27.5)
≥2 hours	160 (80.0)	145 (72.5)
School grade, n (%)		
Junior high school (grades 7 to 9)	93 (46.5)	104 (52.0)
Senior high school (grades 10 to 12)	107 (53.5)	96 (48.0)
Father's occupation, n (%)		
Unemployed	24 (120	33 (16.5)
Government employee	23 (11.5)	50 (25.0)
Private employee	103 (51.5)	51 (25.5)
Self-employed	50 (25.0)	66 (330
Father works from home, n (%)	68 (39.0)	73 (44.0)
Duration of work from home for father, n (%)		
<8 hours/day	36 (52.9)	47 (64.0)
≥8 hours/day	32 (47.1)	26 (35.0)
Mother's occupation, n (%)		
Housewife	114 (11.4)	99 (49.5)
Government employee	19 (9.5)	55 (27.5)
Private employee	43 (21.5)	14 (7.0)
Self-employed	24 (12.0)	32 (16.0)
Mother works from home, n (%)	51 (60.7)	50 (51.0)
Duration of work from home for mother, n (%)		
<8 hours/day	33 (64,7)	27 (54)
≥8 hours/day	18 (35,3)	23 (46)
Family income, n (%)		
Below regional minimum wage	61 (30.5)	105 (52.5)
Regional minimum wage or above	139 (69.5)	95 (47.5)
Number of digital devices used by subject, n (%)		
One	56 (28)	111 (55,5)
More than one	144 (72)	89 (44,5)
Frequency of contact with peers, n (%)		
<3 times	92 (46.0)	69 (34.5)
≥3 times	53 (26.5)	112 (56.0)
No contact with peers	55 (27.5)	19 (9.5)
COVID-19 history in subject, n (%)		
Yes	25 (12.5)	11 (5.5)
No	175 (87.5)	189 (94.5)
COVID-19 history in family, n (%)		
Yes	99 (49.5)	51 (25.5)
No	101 (50.5)	149 (74.5)
Death in the family due to COVID-19, n (%)		
Yes	68 (34)	43 (21,5)
No	132 (66)	157 (74,5)

Table 1. Sociodemographic characteristics of subjects (N=400) (continued)

Characteristcs	Urban (n=200)	Rural (n=200)
Timing of death of close person due to COVID-19, n (%)		
<6 months prior to the study	37 (56	27 (62)
≥6 months prior to the study	29 (44)	15 (35)
Number of times to receive COVID-19 information, n (%)		
<3 times/day	125(62.5)	107(53.5)
>3 times/day	75(37.5)	93(46.5)
Subject's school has reopened		
Yes	168 (84.0)	196 (98.0)
No	32 (16.0)	4 (2.o)

emotional and behavioral issues based on total SDQ score (26/300; 13%) compared to those in urban areas (23/200; 11.5%). However, subjects in rural areas had a slightly higher proportion of prosocial behavior (96%) compared to their urban counterparts (91.5%). Sleep disorders were more common in rural areas than in urban areas (50.5% *vs.* 38%; P=0.012) (**Table 2**).

When we analyzed the SDQ items, we found that adolescents with emotional and behavioral problems may experience more than one type of problem. In rural areas, the most prominent problems were emotional symptoms (25/26) and hyperactivity/inattention (10/26), whereas in urban areas there were higher rates of conduct problems (11/23) and hyperactivity/inattention (10/23) (**Table 3**).

Adolescents with sleep disorders may also experience more than one sleep issue. In rural areas, an overwhelming majority of subjects with sleep disorders had problems in sleep latency (98%), sleep disturbances (98%), and daytime dysfunction (98%), whereas in urban areas 73% of sleep-disordered subjects reported poor subjective sleep quality and 42% reported duration of sleep of <8 hours (**Table 4**). **Table 5** shows that sleep disorders were associated with the risks of emotional and behavioral problems, emotional symptoms, conduct problems, hyperactivity/inattention, and peer relationship problems.

We explored the possible associations of some other subject- and family factors with emotional and behavioral problems. We found that peer relationship problems, history of COVID-19, and death of a family member due to COVID-19 was not associated with emotional and behavioral problems. The only significant factor was the daily frequency of receiving information on COVID- 19 . Those who received information on COVID-19 less than three times a day were less at risk for emotional and behavioral disturbances [PR 0.4 (95%CI 0.2 to 0.8); P<0.01].

Table 2. Proportion of sleep, emotional and behavioral problems and prosocial based on areas

Categories	Urban (n=200)	Rural (n=200)
Total SDQ problems, n(%)	23 (11.5)	26 (13.0)
Total sleep disorders, n(%)	76 (38.0)	101 (50.5)
Adolescents with prosocial, n(%)	183 (91.5)	192 (96.0)

Table 3. Emotional and behavioral problems among subjects based on SDQ subscales

Categories	Urban (n=23)	Rural (n=26)
Emotional symptoms, n	10	25
Conduct problems, n	11	9
Hyperactive/inattention, n	10	10
Peer relationship problems, n	5	9

Table 4. Sleep disorders among subjects based on PSQI

Categories	Urban (n=76)	Rural (n=101)
Poor subjective sleep quality, n(%)	56 (73)	47 (46)
Sleep latency>30 min, n(%)	45 (59)	99 (98)
Sleep duration <8 hours, n(%)	32 (42)	17 (16)
Sleep disoders, n(%)	45 (59)	99 (98)
Daytime dysfunction, n(%)	45 (59)	99 (98)

Table 5. Association of sleep disorders with emotional and behavioral problems

Categories	PR	95%CI	P value
Sleep disorder with emotional problem	4.88	2.976 to 8.031	<0.01
Sleep disorder with conduct problem	3.711	1.532 to 9.041	0.02
Sleep disorder with hyperactivity	6.046	2.581 to 16.176	<0.01
Sleep disorder with peer relationship problem	3.279	1.328 to 8.093	<0.01
Sleep disorder with poor prosocial	1.655	0.732 to 3.742	0.222

Discussion

This study was conducted via online questionnaires due to school closure during COVID-19 pandemic. Out of 469 eligible subjects, 400 were included in our study, resulting in an attrition rate of 17%. Subjects consisted of 200 subjects, each in in the Jakarta Capital Region, an urban area, and Riau Islands province, representing rural areas.

Our study showed that adolescents in urban areas had a higher prevalence of COVID-19 cases (12.5%) than those in rural areas (5.5%). However, the proportion of emotional and behavioral problems was higher in rural than in urban areas (13% *vs.* 11.5%). This study also showed that the rates of emotional symptoms and peer relationship problems were higher among rural adolescents, but conduct and hyperactivity problems were more common in urban adolescents. In contrast, a study in West Java reported higher rates of mental-emotional problems in urban adolescents compared to their semi-urban counterparts. The study found different results among adolescent in urban compared to rural areas in aspects of emotional symptoms, behavior, hyperactivity, interpersonal relationships, social behavior, and total value of emotional mental problems. Adolescents in urban regions were reported to face more challenges, such as higher people density and road traffic, than those in semi-urban areas.[11]

Similar to our study, a study during the COVID-19 pandemic showed that 14.2% of adolescents had problems based on their total SDQ scores, with emotional symptoms reported in 10.6%, peer relationship problems in 38.1%, and conduct problems in 15% of subjects.[1] A study in Bali among adolescents aged 12-15 years showed that 14.5% of adolescent students experienced mental health problems and 6.7% were at risk of suicide. The study supports the need of screening for adolescent mental health, especially in schools, to ensure normal development and detect mental health problems.[4]

Our study found that peer relationship problems, history of COVID-19, and history of death in the family due to COVID-19 were not significantly associated with emotional behavioral problems, whereas the daily frequency of COVID-19 information received was. Adolescents who received information on COVID-19 more than three times a day had a higher risk of emotional and behavioral problems. According to previous studies, factors that negatively affect mental health include living alone without family, hearing bad news, being angry, worrying about the future, and lacking a coping strategy.[12]

The proportion of sleep disorders was significantly higher in rural than in urban areas (50.5% *vs.* 38%; P=0.012). A study in India reported a prevalence of sleep disorders of 39.1%.[13] A study in Denpasar, the provincial capital of Bali, reported that 30.4% of 243 subjects experienced sleep disorders, similar to the prevalence we found in urban regions. The most common sleep disorder in the Bali study was sleep duration of <8 hours a day (62.9%).[7] Another study during the COVID-19 pandemic showed that 78.1% of 104 adolescents had sleep disorders during pandemic.[6] Factors related to sleep disorders among adolescents are the use of digital devices and screen time, including television, computers, and smartphones. A systematic review showed that following age-appropriate screen time and sleep duration recommendations is associated with better mental health than meeting the physical activity recommendation.[14] Our study showed that screen time of >2 hours a day was reported by 80% and 72.5% of adolescents in urban and rural areas, respectively.

Our study showed significant associations of emotional and behavioral problems with sleep

disorders. The Bali study stressed the prominent role of screen time in contributing to sleep disorders,[7] whereas our study showed the significant association of sleep disorders with emotional and behavioral problems.

Our attrition rate was <20%, which shows good subject recruitment despite the study being conducted using online questionnaires due to school closures during the COVID-19 pandemic. Some limitations of our study include the inability to perform polysomnography as the gold standard to diagnose sleep disorders, as well as using the subjects' questionnaire responses as our sole data source, without involving parents or teachers.

In conclusion, our study shows that sleep disorders in adolescents during the COVID-19 pandemic are associated with emotional and behavioral problems. Adolescents who live in rural areas are more likely to have sleep disorders as well as emotional and behavioral disturbances than their urban counterparts.

Conflict of interest

None declared.

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