Sleep problems among adolescents: is there a relation with deliberate self-harm and aggression?

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Background
Adequate sleep during adolescence is important for healthy development and proper daytime functioning. Sleep problems are commonly reported in adolescents, with an estimated prevalence between 17 and 45%. Besides, adolescence period is usually associated with various behavioral problems such as aggression and self-harm.

Aims
The aim of this study was to evaluate sleep habits and the presence of sleep problems in an Egyptian adolescent sample. Moreover, this study aimed to examine the presence of a relationship between sleep problems and the development of aggression and self-harm among those adolescents.

Patients and methods
A total of 117 adolescents in the preparatory stage participated in this study. Three self-report questionnaires were used, Child and Adolescent Sleep Checklist, the Deliberate Self-Harm Inventory, and the Aggression Scale, for students for assessment of sleep problems, deliberate self-harm (DSH), and aggression, respectively, among those adolescents.

Results
A total of 117 adolescents, 51 (43.6%) male and 66 (56.4%) female, participated in this study; their mean age was 13.85±0.81 years. Bedtime problems and daytime problems are more common among adolescents, with higher scores (8.10±3.99 and 6.56±3.61, respectively). Of those, 36 (30.8%) adolescents had a score of 18 or more, and so they were considered to have sleep problems.

The participated adolescents had score ranging from 3 to 38 in the Aggression Scale, with a mean±SD of 12.36±8.32. A total of 24 (20.5%) adolescents had engaged in self-harm according to the Deliberate Self-Harm Inventory.

Moreover, a significant positive correlation ($P<0.001$) was found between sleep problems and both DSH and aggressive behaviors among those adolescents.

Conclusion
Bedtime problems and daytime problems were common among the participated adolescents. Moreover, DSH and aggressive behaviors were reported.

This study provides evidence that there is a strong relationship between sleep problems and both DSH and aggressive behaviors among those adolescents. Early detection, diagnosis, and treatment of sleep problems and promoting sleep hygiene will, undoubtedly, improve adolescents' daily functioning and will have good impact on controlling these annoying behavioral problems.

Keywords:
aggression, deliberate self-harm, sleep problems

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Introduction

Adolescence is one of the most critical and unstable periods during human life, as many biological, psychological, and social changes occur during this period (Hildenbrand *et al.*, 2013). Adequate sleep in adolescence is important for healthy development and proper daytime functioning (Short *et al.*, 2013).

Adolescents need between 9 and 10 h of sleep per night. As a comparison, children need between 10 and 11 h, whereas adults need 7–9 h (Moore *et al.*, 2011).

Adolescents may suffer from not only lack of sleeping an adequate number of hours but also lack of good-quality

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sleep. In fact, the time of release of the sleep hormone, melatonin, is delayed in adolescents due to changes in their biological clock, leading to delayed sleep time (Kim *et al.*, 2015). Nowadays, various activities (e.g. TV watching, electronic gaming, and internet involvement) are also affecting the adolescents' sleep pattern (Ekinci *et al.*, 2014).

Sleep problems are commonly reported in adolescents, with an estimated prevalence between 17 and 45% (Cortese *et al.*, 2013; Adolescent Sleep Working Group, Committee on Adolescence, and Council on School Health, 2014). In one study, a prevalence as high as 65% in Arabian adolescents was reported (Merdad *et al.*, 2014); further assessment of this issue is urgently needed.

The *Diagnostic and statistical manual of mental disorders,* 4th ed., text revision (DSM-IV-TR) (American Psychiatric Association, 2000) classified sleep disorders into four categories: primary sleep disorders, sleep disorders due to a general medical condition, sleep disorders related to another mental disorder, and substance-induced sleep disorders.

Primary sleep disorders were subdivided as follows: (a) dyssomnias (primary insomnia, primary hypersomnia, narcolepsy, breathing-related sleep disorder, and circadian rhythm sleep disorders), which are characterized by abnormalities in the amount, quality, or timing of sleep; and (b) parasomnias (sleep walking, nightmare, sleep terrors, and parasomnia not otherwise specified), which are characterized by unusual or undesirable phenomena that occur during sleep or on the threshold of wakefulness.

However, the *DSM-V* (American Psychiatric Association, 2013) eliminated these delineations to further understanding that most sleep disorders are complex interactions of behavior and biology. The new classification includes 10 sleep disorders: insomnia disorder, hypersomnolence disorder, narcolepsy, breathing-related sleep disorders, circadian rhythm sleep disorders, non-Rapid Eye Movement (REM) sleep arousal disorders, nightmare disorder, REM sleep behavior disorder, restless legs syndrome, and substance or medication-induced sleep disorder.

Sleep disorders can seriously affect the adolescent whole life. Several health-related problems such as smoking, substance abuse, and some cardiovascular and metabolic diseases may also threaten the adolescent's well-being (Ming *et al.*, 2011). As reported in recent studies, adolescents with sleep problems may experience difficulty in getting up in time for school, irritability, confusion, lack of concentration (Saxvig *et al.*, 2012), and may have a higher probability of symptoms or a diagnosis of depression, anxiety disorder, and other significant behavioral and learning problems (Alfano *et al.*, 2013).

Developmentally, adolescents usually have an impulsive and capricious response to the stresses of growth and maturation (Glenn and Klonsky, 2011).

Research studies on adolescent development have taken efforts to understand the roots of several damaging behaviors such as suicide, eating disorders, substance abuse, sexual problems, delinquency, aggression, and, more recently, self-harm (Mehlum *et al.*, 2014).

Aggression is a common problem among adolescents. The prevalence of exhibiting aggressive behavior by the age of 17 years is estimated to be 30–40% for boys and 16–32% for girls (Dane and Marin, 2014). Aggression is a forceful, goal-directed behavior, ranging from social and verbal aggression to physical aggression. Physical aggression (direct or manifest) includes behaviors that threaten or cause physical harm, such as threats of bodily harm (e.g. hitting or pushing), physical fighting, and violent crimes (Marsee *et al.*, 2011). Social aggression (indirect or relational) involves aggression or harming others through manipulation of interpersonal relationships (e.g. spreading rumors, excluding a peer from a group, and trying or threatening to damage someone's social standing within a group). Finally, instrumental aggression is a behavior to achieve their immediate goals (Volk *et al.*, 2012).

Children and adolescents may exhibit aggressive behavior against school property, classmates, teachers, and peers, consequently; it is crucial to study the development of aggressive behavior with a view to develop effective prevention and treatment programs (Berkowitz, 2012).

Besides, there is a complicated and often misunderstood phenomenon that is growing among teenagers and adolescents, self-harm; it can be defined as any deliberate, nonsuicidal behavior that inflicts harm on one's body with the goal of relieving emotional distress (Richardson *et al.*, 2015).

Self-harm has a variety of terms such as self-injury, self-mutilation, and self-abuse. There are many

different ways of harming oneself: cutting, scratching, picking scabs or interfering with wound healing, burning, punching self or objects, infecting oneself, inserting objects in body openings, and bruising or breaking bones (Kapur *et al.*, 2013).

The prevalence of nonsuicidal self-injury (NSSI) among adolescents in community-based studies ranges between 16 and 38% (Wilkinson, 2013).

Although the main goal of self-injury is to relieve emotional distress, people still do not understand why individuals self-harm (Young *et al.*, 2014).

In DSM-IV (Berkowitz, 2012), self-harm has been represented under criterion 5 of borderline personality disorder, considering the controversies about diagnosing personality disorders before adulthood and the fact that considering self-harm diagnostic for borderline personality disorder could lead to inappropriate management. NSSI is the deliberate, self-inflicted destruction of body tissue (e.g. cutting or burning) without suicidal intent and for purposes not socially sanctioned. NSSI is included in the DSM-V as a condition requiring further research before consideration as an official diagnosis. The proposed criteria require NSSI incidents on 5 or more days within the past year, with at least one of the following expectations: to seek relief from a negative feeling or cognitive state, to resolve an interpersonal difficulty, or to induce a positive state.

The aim of the present study was to evaluate sleep habits and the presence of sleep problems in an Egyptian adolescent sample. Moreover, this study aimed to examine the presence of a relationship between sleep problems and the development of aggression and self-harm among those adolescents.

Patients and methods

The study took place during the period from June 2015 to November 2015. Through the first 2 weeks of October, students of the preparatory stage in Delta International Language Schools (Mansoura, Egypt) were asked to join this study. The aim of the study was discussed with the head and the principals of the school who were told clearly that all information that will be obtained from the students will be confidential and will not be shared with their families or teachers; the age and sex of the adolescents were the only personal information needed.

Students were given the choice to participate or withdraw; a few students refused to participate due to lack of interest, personal reasons, or fear of being stigmatized. Students who agreed to participate completed the questionnaires during one teaching period (45 min). A teacher was present to organize the data collection and to ensure confidentiality; research staff could be reached by means of phone by school members when needed; the school was visited twice during the study.

A total of 145 sheets containing the three self-report questionnaires were available at the end of the 2 weeks. A total of 28 sheets were excluded because students drew designs or wrote comments instead of choosing an answer. Finally, 117 students were included in this study.

Instruments

Child and Adolescent Sleep Checklist (CASC) (Oka *et al.*, 2009) is designed to identify sleep habits and to make a screening of sleep problems among preschoolers, elementary school children, and high school students.

CASC has three versions: parental/caregiver version, which is for all age groups (ages 3–18) and is to be filled out by the caregivers; student version for elementary school (ages 6–12), which is to be filled out by students themselves under the instruction of the examiners – that is, teachers, caregivers, or medical professionals; and student version for high school students (ages 12–18), which is to be filled out by the students without instruction. To enable both cross-sectional and longitudinal studies, all these versions use the same set of questions. Currently available language options are English (international version) and Japanese.

CASC Sleep Disturbance Score is calculated based on the responses to the questions on the second page.

The responses were scored as follows:

(1) Always: Three points.
(2) Usually: Two points.
(3) Occasionally: One point.
(4) Never: 0 point.
(5) Do not know: 0 point (for parent version only).

CASC Sleep Disturbance Score=sum of the scores of 24 questions. The score ranges from 0 to 72. Children with CASC Sleep Disturbance Score of 18 or more are considered to have sleep problems.

CASC scores are subdivided into four categories:

(1) Bedtime problems: Q1–Q6 (six questions).
(2) Sleep breathing and unstable sleep: Q7–Q12 (six questions).
(3) Parasomnia and sleep movement: Q13–Q18 (six questions).
(4) Daytime problem: Q19–Q24 (six questions).

For preparing an Arabic version of CASC, translation, back translation, and validity were carried out through the cooperation of a postgraduate member in the English Language Department, Faculty of Arts, Mansoura University. The reliability was examined using the test–retest method (with 2-week interval) with Cronbach's α coefficient (0.87) through the cooperation of the Department of Community, Faculty of Medicine, Mansoura University.

The Deliberate Self-Harm Inventory (DSHI) (Gratz, 2001) was designed to measure nonsuicidal deliberate self-harm (DSH); it is a self-report questionnaire that measures frequency, age of onset, duration, date of last occurrence, and severity of 17 types of self-harming behavior. The individual is required to report the relative frequency of each type of behavior on a five-point scale: never, seldom, sometimes, often, and always. The DSHI has adequate internal consistency (α=0.82), temporal reliability (r=0.92), and support for validity. For descriptive purposes, we used the following indexes: frequency – that is, the number of episodes per month (seldom: episodic self-harm; sometimes-to-always: repetitive self-harm); types of self-harming behaviors (e.g. self-cutting, self-burning, etc.); and diversification – that is, occurrence of multiple types of self-harming behaviors measured on a three-level scale (0–1 types: minimum diversification; 2–4: moderate diversification; and 5–11: high diversification).

The Aggression Scale for students

The Aggression Scale is a self-report questionnaire (Orpinas and Frankowski, 2001) for elementary and middle school students that measures the frequency of self-reported aggressive behaviors, which may result in physical or psychological injury to other students – for example, pushing, name-calling, hitting, and/or threatening. The range of internal consistency was 0.87–0.88. The scale consists of 11 questions representing a series of aggressive behaviors. Students are asked to mark with a circle the number of times they engaged in each behavior during the last 7 days (range: 0–6+ times). This scale is scored by adding all responses. Possible range is between 0 and 66 points. Each point represents one aggressive behavior the student reported engaging in during the week before the survey. If four or more items are missing, the score cannot be computed. If three or less items are missing, these values are replaced by the respondent's average.

For preparing an Arabic version of the DSHI and the Aggression Scale for students, translation and back translation were carried out through the cooperation of a postgraduate member in the English Language Department, Faculty of Arts, Mansoura University.

Statistical analysis

Data were analyzed using statistical package for the social sciences (SPSS, version 15; SPSS Inc., Chicago, Illinois, USA). Qualitative data were presented as number and percentage. Comparison between groups was made using the χ^2-test. Quantitative data were presented as mean±SD. Student's t-test was used to compare two groups. Pearson's correlation coefficient was used to test correlation between variables. A P value of less than 0.05 was considered to be statistically significant.

Results

A total of 117 adolescents, 51 (43.6%) male and 66 (56.4%) female, participated in this study; their mean age was 13.85±0.81 years (Table 1).

Bedtime problems and daytime problems were more common among adolescents, with a score of 8.10±3.99 and 6.56±3.61, respectively (Table 2). A total of 36 (30.8%) of those adolescents had a score of

Table 1 Descriptive data of adolescent sample

	Range	Mean±SD
Age	13–15	13.85±0.81
Sex [*n* (%)]		
Male	51 (43.6)	
Female	66 (56.4)	

Table 2 Results of Child and Adolescent Sleep Checklist

	Range	Mean±SD
Bedtime problems	1–16	8.10±3.99
Sleep breath	0–7	1.26±1.43
Parasomnia sleep move	0–4	1.33±1.37
Daytime problems	1–14	6.56±3.61
Total [*n* (%)][a]	3–34	17.26±7.98
<18	81 (69.2)	
>18	36 (30.8)	

[a]Adolescent with Child and Adolescent Sleep Checklist Sleep Disturbance Score of 18 or more is considered to have sleep problems.

18 or more, and thus they were considered to have sleep problems.

The participated adolescents had scores ranging from 3 to 38 in the Aggression Scale, with a mean±SD of 12.36±8.32 (Table 3).

A total of 24 (20.5%) adolescents had engaged in self-harm behavior according to the DSHI.

Table 4 highlights a nonsignificant increase in sleep problems among 21 (31.8%) female adolescents compared with 15 (29.4%) male adolescents. As regards frequency of DSH, there was a nonsignificant increase in repetitive DSH among female adolescents. However, the incidence of sticking pins into the skin was significantly high among male adolescents (P=0.004). Moreover, minimum diversification was significantly high among female adolescents (P=0.022). Finally, aggressive behavior was significantly high among male (16.35±9.38) compared with female adolescents (9.27±5.81) (P<0.001).

There was a significant positive correlation (P<0.001) between sleep problems and DSH; the mean incidence of sleep problems among adolescents who reported DSH behavior was 28.63±3.92, and the incidence of sleep problems among non-DSH adolescents was 14.32±5.84 (Table 5).

There was a significant positive correlation (P<0.001) between sleep problems and aggression among adolescents (Table 6).

Table 3 Results of Aggression Scale and the Deliberate Self-Harm Inventory

	Range	Mean±SD
Aggression Scale	3–38	12.36±8.32
DSH [*n* (%)]	24 (20.5)	

DSH, deliberate self-harm.

Discussion

The aim of the present study was to evaluate sleep habits and the presence of sleep problems in an Egyptian adolescent sample. Moreover, this study aimed to examine the presence of a relationship between sleep problems and the development of aggression and self-harm among those adolescents. A total of 36 (30.8%) adolescents in this sample were found to have sleep problems. Recent research studies estimated the prevalence of sleep problems among adolescents to be between 17 and 45% (Saxvig *et al.*, 2012; Cortese *et al.*, 2013; Adolescent Sleep Working Group, Committee on Adolescence, and Council on School Health, 2014). A prevalence as high as 65% was reported (Merdad *et al.*, 2014) in another recent Arabian study (Satti *et al.*, 2015), in which about 25% of the examined sample reported sleep problems. Further assessment of this issue is urgently needed.

Bedtime and daytime problems were found to be more common among adolescents. This is consistent with the findings of recent research studies (Gradisar *et al.*, 2011; Leger *et al.*, 2012; Short *et al.*, 2013), which suggest that total sleep time in adolescents tends to decrease and the timing of sleep tends to be delayed; this pattern seems to be common among high school

Table 4 Sex differences in sleep problems (frequency, types, and diversification of deliberate self-harm and aggression)

	Male (*n*=51) [*N* (%)]	Female (*n*=66) [*N* (%)]	χ^2	*P*
Sleep problems[a]	15 (29.4)	21 (31.8)	0.078	0.780
DSH				
Frequency				
Repetitive	0 (0)	6 (9.1)	5.031	0.081
Episodic	9 (17.6)	9 (13.6)		
Types				
Preventing wound from healing	3 (5.9)	3 (4.5)	0.106	0.745
Carving words	3 (5.9)	3 (4.5)	0.106	0.745
Carving designs into skin	3 (5.9)	3 (4.5)	0.106	0.745
Sticking pins into skin	6 (11.8)	0 (0)	8.184	0.004*
Biting skin	0 (0)	3 (4.5)	2.379	0.123
Punching yourself	0 (0)	3 (4.5)	2.379	0.123
Banging head	3 (5.9)	3 (4.5)	0.106	0.745
Scratching skin	3 (5.9)	0 (0)	3.985	0.046
Diversification				
Minimum	3 (33.3)	12 (80)	5.227	0.022*
Moderate	6 (66.7)	3 (20)		
Aggression Scale	16.35±9.38	9.27±5.81	*t*=4.734	<0.001*

DSH, deliberate self-harm. [a]Sleep problems: score>18 on Child and Adolescent Sleep Checklist. *Significant, P<0.05.

Table 5 Correlation between sleep problems and deliberate self-harm

	No DSH (*n*=93)	DSH (*n*=24)	*t*	*P*
Sleep problems	14.32±5.84	28.63±3.92	11.343	<0.001*

DSH, deliberate self-harm. *Significant, $P<0.05$

Table 6 Correlation between sleep problems and aggression

	Sleep problems	
	r	*P*
Aggression Scale	0.865	<0.001*

*Significant, $P<0.05$.

students, leading to increased daytime sleepiness and to a significant impact on daytime functioning and academic achievement.

In addition, in this study, a nonsignificant increase in sleep problems among female adolescents was present; this difference may be due to the physiological changes of puberty. Significant sex difference was reported in some studies (Huang *et al.*, 2010; Merdad *et al.*, 2014).

As regards DSH, 24 (20.5%) adolescents had engaged in self-harm behavior; a higher prevalence was recorded in other countries (Hawton *et al.*, 2012; Wilkinson, 2013; Franklin *et al.*, 2014). Perhaps, the relatively low prevalence in this study is due to sociocultural and religious effects.

However, in this sample, adolescents also manifested episodic and minimum-to-moderate diversified self-harm behavior.

Greater frequency and diversification of self-harm were associated with female sex; this is in agreement that reported in prior similar study (Ferrara *et al.*, 2012). Perhaps, girls are more likely to hide unwanted feelings of anger or anxiety.

Besides, this study revealed variable aggressive behavior among adolescents, noticing that male adolescents were more affected compared with female adolescents. This may be due to the effect of the sex hormones and cultural norms of male behavior, and these data were consistent with some recent studies (Dane and Marin, 2014; Sadeghi *et al.*, 2014).

Finally, there is a strong positive correlation between sleep problems and both DSH and aggressive behaviors among those adolescents. These results are supported by recent studies, which reported that sleep problems are correlated positively with aggression (Kamphuis *et al.*, 2012; Pirinen *et al.*, 2014) and self-harm (Hysing *et al.*, 2015) after accounting for other risk factors.

Several hypotheses (Kamphuis *et al.*, 2012) tried to explain the relationship between poor sleep and undesirable behaviors such as aggression and self-harm; sleep problems may result in poor prefrontal cortical functioning, which seems to increase serotonin turnover, hypothalamic–pituitary–adrenal axis dysfunction, and finally individual vulnerability.

Conclusion

Bedtime problems and daytime problems were common among the participated adolescents. Moreover, DSH and aggressive behaviors were reported. This study provides evidence that there is a strong relationship between sleep problems and both DSH and aggressive behaviors among those adolescents. Early detection, diagnosis, and treatment of sleep problems and promoting sleep hygiene will, undoubtedly, improve adolescents' daily functioning and will have good impact on controlling these annoying behavioral problems.

Recommendations

The following are recommended:

First, to provide simple guidelines with regard to adequate sleep hygiene to parents and school members. Keeping them informed with up-to-date research studies is the best possible way for introducing healthy sleep habits among adolescents.

Second, to conduct further research with regard to DSH as regards prevalence, psychopathology, and management.

Third, to consider adequate sleep hygiene a milestone in the treatment of behavioral problems such as DSH and aggression.

Limitations

The sample size was relatively small due to time constraints and limited resources, and so further assessment with larger samples is needed.

Moreover, all data collected were derived from self-reported questionnaires, which might have affected the results. In addition, self-evaluation tools may be affected by cognitive biases, including recall bias and erroneous self-perception.

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Conflicts of interest

There are no conflicts of interest.

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