

# Sleep Complaints as Risk Factor for Suicidal Behavior in Severely Depressed Children and Adolescents

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## Keywords

Affective disorder; Children; Sleep; Suicide.

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## SUMMARY

**Objectives:** To investigate the association between sleep complaints and suicidal behaviors among severely depressed children and adolescents. **Methods:** The sample was 214 youths (56.1% males, mean age 12.5 years) with diagnosis of DSM-IV major depressive disorder consecutively recruited from a university-based outpatient clinic specialized in mood disorders. The structured interview for children and adolescents was applied to participants. The Children's Depression Rating Scale—revised version—scored the severity of depression, and the Children's Global Assessment Scale assessed the global functioning. Subgroups of patients were compared for psychopathological association by means of logistic regression, in accordance with presence and absence of sleep complaints and suicidality. **Results:** The frequency of sleep complaints and suicidal behaviors was, respectively, 66.4% and 52.3%, and both symptoms were observed in 37.9% of patients. Initial insomnia was the most frequent manifestation (58%), followed by night awakening (36%), daytime sleepiness (31%), and early awakening (29.9%). Significant association between sleep disturbance and suicidal behavior was found (odds ratio range of 2.3–10.8). **Conclusion:** Sleep disturbances are potential warning manifestations of suicidal behaviors in depressed youth. Possibly, the severity of the active affective episode likely underlies in both sleep complaints and suicidal behaviors among depressed underage patients.

## Introduction

According to American Association of Suicidology, the disruption of sleep schedules is considered a potential warning sign of suicide [1,2]. A recent systematic review has indicated the relationship between shortened sleep period (<6 h) and suicidal behavior (SB) in the context of an active psychiatric disorder [3]. Depressive episodes with sleep disturbances are the psychiatric condition most commonly linked with suicide [3–8]. In adolescents, insomnia was a consistent finding among depressed suicidal subjects [3,4,8,9]. Confirming studies about the influence of sleep disturbances on suicidality [4,5,8,10], Goldstein et al. [11] showed that there is a significant association between sleep disturbance and completed suicide in an adolescent population.

Several studies reported that 40–80% of adolescents who committed suicide did so during a depressive episode [12–16]. High occurrence of suicidal ideation has been well documented among youth with affective disorders [17], where almost 70% of teenagers present suicidal ideation during depressive episodes [4,18,19]. Existing studies also support the notion that SB is common in adolescents with abnormal sleep schedule, being their sleep disturbances associated with either a sleep phase delay or

advance and complaints of insomnia or hypersomnia [20]. Moreover, suicide was the third leading cause of death among adolescents from 15 to 19 years of age in 2000 [21], and the suicide rate among children and adolescents has been increasing dramatically in the last decade [22].

The literature has indicated several risk factors for suicide: mental disorder, past suicide attempts, social isolation, family conflict, unemployment, and physical illness, agitation, serotonergic dysfunction and, particularly, sleep problems [23]. Definitional issues have been reviewed regarding distinctions between suicidal ideations, suicide attempts, and death by suicide, highlighting the multidimensional nature of suicide and suicide-related behaviors [24,25]. The nature of suicide also has been characterized as a group of symptoms that can be identified by SB according to the Glossary of the National Strategy for Suicide Prevention [26,27]. Although the neurobiology of suicide has been deemed as a promising research topic, few far-reaching studies on SB in youth have been conducted so far [28]. For instance, Hazel (2002) [29] has noted the tendency of depression to have an insidious onset in children and unnoticed symptoms appear because of the psychopathological fluctuation in the intensity of depression. Notwithstanding, there is a dearth of knowledge on the effect of sleep complaints (SC) in depressive episode, as well as how these

symptoms can affect the cognitive processes occurring along with SB.

In previous literature on suicidology, researchers have correlated SC with SB, but the severity of major depression and the subtype of sleep disturbances were rarely evaluated [30]. In a recent meta-analysis on sleep disturbance and suicidal thoughts and behavior [31], only 10 of 39 eligible studies have selected depressed subjects with sound description of the sample type and even less studies with sample of children and/or adolescents were conducted [30,31]. Possibly, suicide attempts may emerge from bidirectional liability among maladaptive cognition, behavior, and affective responses to stressors [32]. There are scarce studies showing the association between sleep and SB in underage samples. During childhood and adolescence, these dysfunctional responses can be amplified and sleep disruption can be hypothesized as early alarm signs for suicidal cognition and behavior. Following these facts, it is still not clear whether SC can be a potential marker of SB, and based on this hypothesis, we examined a sample of severely depressed youth.

The aim of this study was to investigate the association between SC and SB in a sample of depressed children and adolescents.

## Materials and Methods

This is a cross-sectional investigation conducted in a university-based outpatient clinic specialized in child and adolescent mood disorder.

### Sample

Our target population was depressed children and adolescents, both sexes and with age ranging from 6 to 17 years, whom were referred for treatment at the Child and Adolescent Affective Disorders outpatient clinic of the Institute of Psychiatry at the University of Sao Paulo, Brazil. The participants were consecutively recruited with their parents or responsible persons, between 1998 and 2006. The final sample was made up of 214 youths with clinical diagnosis of current DSM-IV major depressive disorder. We considered threshold for adolescence as 13 years and over.

### Clinical Assessment and Definitions

At the index time, all subjects were assessed through a face-to-face clinical interview with the patients and their parents, performed directly by the senior psychiatrist (LFI). Structured clinical interview and standardized instruments further evaluated psychopathological features of subjects with evidence of current depression. The Diagnostic Interview for Children and Adolescent DSM-IV version (DICA-IV) [33] was applied by attending psychiatrists for children or adolescents, and separately from their parents. All psychiatric diagnoses were ascertained following DSM-IV criteria. Patients with comorbid conditions such as separation anxiety, social phobia, generalized anxiety, and simple phobia were included. Conversely, those patients with evidence of DSM-IV nonaffective psychosis, attention deficit and hyperactivity disorder, eating disorders, and mental impairments induced by drugs or clinical illnesses were excluded of the final sample and statistical analysis. The severity of depression was assessed by the

Children's Depression Rating Scale, revised version (CDRS-R) [34], and the overall functioning by the Children's Global Assessment Scale (CGAS) [35]. Clinical research interviewers were trained for calibration purposes and assessed the patients under the supervision of the senior psychiatrist.

The depressive episode section of DICA-IV incorporates a set of questions about the presence of subjective changes of sleep, including two questions about initial insomnia, two questions about sleep maintenance insomnia, two questions about early awakening insomnia, and two questions about hypersomnia. The assessment of suicidality was performed with the DICA-IV's mood disorders section and included five questions on morbid ideation, desire to be dead, suicidal ideation, suicide plan, and suicide attempt. All of these questions rated the presence of current symptoms lasting at least 2 weeks before the interview.

For analytical purpose, we adopted a definition of SC as a grouping of four distinct, but somewhat overlapping, forms of complaints occurring during current depressive episodes:

1. Initial insomnia: patient takes more than 30 min to fall asleep;
2. Night awakening: patient awakes during the night for any reason, from a simple awakening with no identified cause to being awakened by nightmares, and excludes physiological needs (nocturia or hunger) and external causes for patient awakening, such as loud noises or other people calling;
3. Early awakening: patient reports waking at least 30 min before the alarm clock sounded or before his or her usual wake-up time;
4. Daytime sleepiness: patient claims to present or presents sleepiness, or routinely sleeps more than his usual time.

According to the Glossary of the National Strategy for Suicide Prevention (NSSP) [26,27], SB was defined as a spectrum of psychic activities related to cognitions and behaviors that include suicidal thoughts, suicide attempts, and completed suicides. This glossary also defined suicidal ideation as "self-reported thoughts of engaging in suicide-related behavior". Based on the sources provided by the NSSP, we considered SB in this study as a cluster of following suicidal cognitions and behaviors presenting during a depressive episode:

1. Morbid ideation: patient showing general recurrent thoughts about death;
2. Thoughts of death: patient desires to be dead and could recognize his or her wish to be dead;
3. Suicidal ideation: patient has thoughts about the details of his or her own death. For example, patient fantasizes dying in a car crash, having a bus run themselves over;
4. Suicidal planning: patient makes a detailed plan of how to kill him/herself. For example, patient plans storing their medication to take them and overdose when their parents are away, or patient searches for a high window to jump out of;
5. Suicidal attempt: patient presents potentially self-injuring behavior with a nonfatal outcome, for which there is evidence that they intended to kill themselves. In this study, the patients could be identified as being in more than one category.

In summary, for the final sample of 214 depressed youths, 142 patients presented SC, 61 presented SC without SB, and 81 presented both SC and SB. The reference subgroup was the 142 SC patients presenting with or without SB, to contrast the association between SC and SB in children and adolescents during a current depressive episode.

## Statistical Analysis

Descriptive analyses depicted demographic characteristics, depressive symptoms, and clinical outcomes in the target population in terms of proportion (%) and mean and standard deviation (SD). For the purpose of contrasting subgroups, the patients were divided as (1) presenting with or without SC, and (2) presenting with or without SB among sleep complainers. We performed groupwise comparisons of categorical clinical variables (e.g., sex and depressive symptoms) by chi-square ( $\chi^2$ ) test. For continuous variables (e.g., age and rating scales CDRS-R and CGAS), the F statistics of one-way analysis of variance (ANOVA) computed the between-group difference in accordance with mean score of each subgroup.

Following, the correlation between each SC and each SB was calculated, and the association between the occurrence of each SC and each SB was estimated by logistic regression, with the SC as the dependent variable (0 = absence and 1 = presence). The strength of the association between SC and SB variables was expressed in terms of odds ratio (OR) and 95% confidence intervals (CI) controlled for severity in accordance with CGAS score. All analyses were performed using a Statistical Package for Social Sciences 18.0 (SPSS Inc., Chicago, IL, USA). All statistical tests of significance were performed using two-tailed tests with  $\alpha$  set as 0.05.

## Ethics of the Study

The study was in accordance with university review board guidelines, and we obtained approval from the institutional ethics committee. Before the initial evaluation, parents or legal guardians of the subjects have signed an informed consent forms.

## Results

Descriptive and comparative analyses of demographic characteristics, severity, and occurrence of depressive symptoms of subjects are shown in Table 1, for total sample ( $n = 214$ ), subgroups in relation with the presence of SC ( $n = 142$ ), and the presence of SB among these sleep complainers ( $n = 81$ ). For the target population, there were more boys than girls in the sample (56.1% vs. 43.9%). Two-thirds of sample reported at least one type of SC. Although both gender groups did not differ in terms of disrupted sleep, the SC groups reported more SB ( $P = 0.01$ ). For the subgroup of patients presenting with both SC and SB, there were 44 girls versus 37 boys, and for the subgroup of SC patients without SB, there were 20 girls versus 41 boys. Regarding the distribution of age (12.5 years SD 3.1), no difference emerged for mean age or developmental stages of children versus adolescents. The scores of depressive symptoms and overall global functioning presented by the total sample revealed that the population under study comprised of highly symptomatic and severely impaired depressed youths, respectively, mean CDRS-R = 78.1 (SD 7.6) and mean

CGAS = 40.5 (SD 7.9). Despite the fact that affective disorders were the major condition in all patients, most also presented manifestations of anxiety: only 29% did not report any symptom of anxiety, and 71% showed symptoms of anxiety.

Concerning symptomatic manifestations of depression, the subgroup of patients with SC presented significantly more symptoms of anhedonia, psychomotor retardation, fatigability, hopelessness, and suicidal behaviors than those without SC. The subjects with SC were significantly more functionally impaired than those without SC ( $P = 0.001$ ), in terms of mean CGAS score. Conversely, there was no difference between SC subgroup with and without SB (see Table 1).

Notably, SB occurred in 57% of depressed youths with SC. The comorbid SC patients reporting SB ( $n = 81$ ) were more likely to present irritable mood, low motivation, fatigability, worthlessness, and inappropriate guilt than those SC patients without SB ( $n = 61$ ). The symptomatic occurrence of irritable mood, low motivation, fatigability, worthlessness, inappropriate guilt, and hopelessness was significantly higher in the subgroup with both SC and SB. Despite that the whole group presented SC, complaints about initial insomnia, early awakening, and hypersomnia occurred significantly more in those who reported SB. In terms of mean CDRS-R score, the subgroup of depressed children and adolescents with both SC and SB presented significantly more depressive symptoms than the SC subgroup without SB ( $P < 0.001$ ). However, both SC subgroups presented similar level of severity (CGAS: 38.6 vs. 40.2, NS), indicating major impairment of functioning in several areas and unable to function in key domains, for example, disturbed at home, at school, with peers, or in society at large, showing markedly withdrawn behavior or suicidality with clear lethal intent.

In the correlation analysis considering whether the symptomatic group of SC was related to symptomatic group of SB, we observed a trend of symptom overlapping between SC and SB ( $P = 0.053$ ). Table 2 shows correlation matrix of independent symptoms of SC and SB. It is worth noting that the “early awakening” and “daytime sleepiness” were significantly correlated with all symptoms of SB. In particular, the “initial insomnia” presented correlation with the occurrence of SB, specially to “morbid ideation”, “thought of death,” and “suicidal ideation,” all at  $P < 0.05$  level. Although “night awakening” did not correlate with “SB” as group, significant correlations were observed for “suicidal ideation,” “suicidal plan,” and “suicidal attempt.”

Thereafter, we performed logistic regression analysis to assess the association of each specific SC with different types of SB in the sample (Table 3). The likelihood of “early awakening” was associated with “SB” (OR 2.3), “morbid ideation” (OR 2.5), and “suicidal attempts” (OR 4.4). Following, “night awakening” was associated with “suicidal ideation” (OR 4.4), “suicidal plan” (OR 4.9), and “suicidal attempts” (OR 4.8), and “initial insomnia” with “SB” (OR 4.9), “suicidal ideation” (OR 6.0), and “suicidal attempts” (OR 10.8). Finally, “daytime sleepiness” was associated with “suicidal ideation” (OR 9.5) and “suicidal attempts” (OR 5.5). Although all associations were significant at  $P < 0.05$ , large 95% CI emerged due to small sample size.

## Discussion

The current investigation represents an addition to evidence of the association between suicidal behaviors and sleep complaints

**Table 1** Demographic characteristics, depressive symptoms, and severity in clinically depressed youths. Group-wise comparisons between those with and without sleep complaints, and between those with and without suicidal behaviors among sleep complainers

	Total sample N = 214	Sleep complaint (SC)			Suicidal behavior (SB) among sleep complainers		
		With SC n = 142	Without SC n = 72	P	With SB n = 81	Without SB n = 61	P
<b>Demographic</b>							
Female (%)	43.9	45.1	41.7	NS	54.3	32.8	0.01
Male (%)	56.1	54.9	58.3	NS	45.7	67.2	0.01
Age, mean (SD)	12.5 (3.1)	12.6 (3.1)	12.3 (3.2)	NS	13.0 (3.1)	12.1 (3.0)	NS
<b>Depressive symptoms (%)</b>							
Depressive mood	84.1	86.6	79.2	NS	87.7	85.2	NS
Irritable mood	61.7	62.0	61.1	NS	71.6	49.2	0.009
Anhedonia	80.8	85.9	70.8	0.008	88.9	82.0	NS
Low motivation	56.1	56.3	55.6	NS	65.4	44.3	0.02
Appetite alteration	79.4	84.5	69.4	0.01	85.2	83.6	NS
Agitation	50.5	49.3	52.8	NS	50.6	47.5	NS
Psychomotor retardation	53.3	63.4	33.3	<0.001	67.9	57.4	NS
Fatigability	59.8	66.9	45.8	0.003	75.3	55.7	0.02
Worthlessness	52.8	55.6	47.2	NS	75.3	29.5	<0.001
Inappropriate guilty	41.6	44.4	36.1	NS	63.0	19.7	<0.001
Decrease concentration	75.2	77.5	70.8	NS	81.5	72.1	NS
Difficulty making decision	43.9	45.8	40.3	NS	51.9	36.1	NS
Hopelessness	51.4	57.7	39.9	0.009	72.8	37.7	<0.001
Suicidal behavior	52.3	57.0	43.1	0.05	100.0	–	–
CDRS-R	78.0 (7.6)	78.6 (7.1)	76.9 (8.5)	NS	80.4 (6.4)	76.3 (7.3)	<0.001
CGAS severity	40.5 (7.9)	39.3 (7.5)	42.9 (7.9)	0.001	38.6 (7.4)	40.2 (7.6)	NS

SC, sleep complaint; SB, suicidal behavior; CDRS-R, Children's Depression Rating Scale—revised version [34]; CGAS, Children's Global Assessment Scale [35]; NS, nonsignificant.

**Table 2** Matrix of correlation between sleep complaints and suicidal behaviors in clinically depressed youths (n = 214)

Sleep complaints	Suicidal behaviors (n = 112)	Morbid ideation (n = 86)	Thought of death (n = 66)	Suicidal ideation (n = 70)	Suicidal plan (n = 50)	Suicidal attempt (n = 28)
Initial insomnia (n = 126)	0.191*	0.161*	0.147*	0.137*	0.102	0.014
Night awakening (n = 77)	0.131	0.120	0.132	0.204**	0.161*	0.142*
Early awakening (n = 50)	0.306**	0.306**	0.270**	0.233*	0.159*	0.178*
Daytime sleepiness (n = 44)	0.184*	0.168*	0.279**	0.205**	0.174*	0.120*

\* $P < 0.05$ , \*\* $P < 0.01$ .

in a clinical sample of severely depressed children and adolescents. Sleep symptoms and SB might interact with each other, and this co-occurrence can be a particular risk factor marker for the intensity of early-onset depression. This sample of depressed youth was functionally impaired and severely symptomatic, mainly in subgroups reporting more sleep disruption and self-destructive cognition or behavior. The assessment of general functioning of patients with sleep complaints (SC) indicated that this subgroup presented higher level of impairment in comparison with the subgroup without SC, irrespective of the presence or absence of suicidal behaviors (SB).

The excess of SC and SB in girls might suggest bidirectional interplay between both types of symptoms, under the influence of gender difference and hormonal processes. In the same direction, some authors have reported that complaints of insomnia might be

influenced by pubertal developmental stages [36]. Concerning the overlap between SC and SB, early awakening and daytime sleepiness were the sleep symptoms most related to self-harm cognitions and behaviors. Initial insomnia and night awakening also presented salient relationship with some suicidal cognition.

The clinical findings indicated that younger depressed patients might present frequent sleep deregulation and SB may be a group of symptoms that are related to severity worsening. Possibly, a constellation of SC is included in the pathophysiological process of depression [37,38], but these manifestations are not necessarily correlated with the progression of the disease and might be associated with impulse control and functional impairment [39,40]. Severely depressed patients might be thinking more often about death during initial insomnia [41]. Likewise, they might be idealizing terminating their own life, be planning or attempting suicide

**Table 3** Association between sleep complaints and suicidal behaviors in clinical sample of severely depressed children and adolescents (n = 214)<sup>a</sup>

Variable	OR	CI 95%	P
Early awakening (n = 50)			
Suicidal behavior (n = 112)	2.3	1.1–4.9	<0.0001
Morbid ideation (n = 86)	2.5	1.3–5.0	<0.0001
Suicidal attempts (n = 28)	4.4	1.9–10.4	0.05
Night awakening (n = 77)			
Suicidal ideation (n = 70)	4.4	2.4–8.0	<0.0001
Suicidal plan (n = 50)	4.9	2.5–9.5	0.004
Suicidal attempts (n = 28)	4.8	2.1–10.9	0.008
Initial insomnia (n = 126)			
Suicidal behavior (n = 112)	4.9	2.8–8.8	0.005
Suicidal ideation (n = 70)	6.0	3.2–11.2	<0.0001
Suicidal attempts (n = 28)	10.8	4.7–25.2	0.005
Daytime sleepiness (n = 44)			
Suicidal ideation (n = 70)	9.5	9.1–10.0	0.002
Suicidal attempts (n = 28)	5.5	2.2–13.2	0.03

OR, odds ratio; CI, confidence interval.

<sup>a</sup>Controlled for severity in accordance with CGAS score.

during early awakening. Further studies on this theme are needed to better explain the relationship between sleep and suicidal rumination.

Early awakening was consistently related to the whole group presenting SB, for example, morbid ideation. Disruptive sleep might change some cognitive processes. According to Bernet and Joiner (2007), severely depressed patients who attempted suicide reported sleep disturbances at higher frequency [20]. The researchers also indicated in their review that sleep disturbances and SB might share a common neurobiological basis. Because serotonergic neurotransmission is involved in the promotion and modulation of behavioral states, serotonin system may play a significant role in suicide and the regulation of sleep [20].

Excessive daytime sleepiness was frequent among patients and significantly associated with higher levels of depression and particularly with suicidal ideation [42]. The increase in sleepiness in patients with depression may be a consequence of sleep stage fragmentation. The association between SC and SB states can be followed by the reduction in sleep together with daytime sleepiness, and these symptoms can increase the severity of depressive symptoms and the suicide risk.

It was noteworthy that initial insomnia was associated with these SB related to cognitive process (e.g., morbid ideation, thoughts of death, and suicidal ideation). In fact, it has been well described that sleep disorders such as insomnia and parasomnia (e.g. sleep walking, sleep talking, or restless legs) represented around 42% of psychiatric patients' sleep claims [42]. Furthermore, insomnia and sleep continuity disorders (awakening at night), as well as sleep–wake reversal, have been associated with an increased risk for both developing and recurrence of depressive episodes, increased severity of depressive symptoms [42], and the risk of suicide [43]. However, it is still unclear whether the SC–SB association might be independently explained by depression [44,45]. Moreover, the noticeable SC as a potential factor that plays a role in the transition between distinctive SB manifestations

remains poorly understood. This appealing hypothesis seems to be consistent with the literature about the neurobiological dysfunction of affective disorders (e.g., prefrontal cortex dysfunction, serotonin neurotransmitters, aggressive behavior, impulsivity, and REM sleep) [41], which suggested a possible association between nightmares and night awakening.

The association between night awakening and suicidality in our patients included a wide range of SB, such as thoughts of death, suicidal ideation, plan, and attempt. In our data, the occurrence of nighttime awakening was more frequent in those patients who reported suicidal ideation or planned suicide. In agreement with the literature, several types of SC were described among patients who had attempted suicide, and nightmares were independently associated with SB [46]. In fact, nightmares were not uncommon in young children [47]. Interestingly, the presence of nightmares might be associated with nocturnal awakenings, and recent studies suggested that insomnia and nightmares would interact to increase suicidality in depressed subjects in adulthood [48]. This interaction can also affect children and adolescents with depression [49]. Examining the prospective relationship of disease severity during all stages of development of depressive symptomatology, as well as the associated functional impairment in the full spectrum of severity of major depressive disorder, can shed light on the complex interaction of SC and SB in depressed youth.

## Limitations

As the subjects of this clinical sample were recruited in a university-based teaching hospital, the selected patients might be more severe than other populations, where selection bias might have affected the magnitude of the results. The cross-sectional design of current study also represented a limitation, being impossible to discriminate the direction of causality between SC and SB. Probably, future longitudinal data will allow clarifying the nature of this association in young age depressed patients. Although our findings on the association between SC and SB symptoms in severely depressed patients were consistent, more wide-ranging studies must evaluate remission status and the course of SB–SC association in mildly depressed patients.

The complete set of sleep problems was obtained from a structure interview for generating diagnosis of DSM-IV depression. Therefore, future studies must include validated instruments such as the Morin's Insomnia Severity Index [50]. For instance, the presence of nightmares was not properly assessed in current study. Also, we did not distinguish between passive suicidal ideation and active suicidal ideation.

Because psychiatric diseases in children commonly used to present multiple symptoms, the presence of anxiety symptoms in the majority of the sample should be viewed as a potential confounding factor. In this observational study, the influence of comorbid diagnoses with other psychiatric disorders or administration of psychotropic medications on SC needs to be ruled out.

Finally, a larger representative and inclusive sample is desirable to strengthen the association between SC and SB. Small sample size and recruitment bias might have generated some divergences between the findings of present investigation and similar studies in adults.

## Clinical Implication and Conclusion

The findings of present study confirm a relationship between SC and SB with a relevant association between initial insomnia and suicidal behaviors, and particularly, an association between suicidal ideation and sleep complaints in depressed children and adolescents. Sleep loss in youth can increase suicidal behaviors, which has been a neglected topic in the literature. Further inclusive studies with a larger sample are needed to verify the particular correlation of each sleep symptom with the full spectrum of suicidal cognitions and behaviors.

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## Conflict of Interest

The authors declare no conflict of interest.