

# Adolescent Sleep Quality and Hormonal Regulation Influencing Emotional Well-Being and Resilience

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## Abstract

**Background:** Sleep quality plays a critical role in adolescent growth, cognitive functioning, emotional regulation, and overall health. Hormonal processes involving melatonin, cortisol, and growth hormone are closely linked to sleep patterns and may significantly influence emotional well-being and psychological resilience. Poor sleep quality during adolescence has been associated with emotional instability, stress, anxiety, and reduced coping abilities.

**Objective:** To assess the relationship between sleep quality, hormonal regulation, emotional well-being, and resilience among adolescents.

**Methodology:** A cross-sectional study was conducted among **300 adolescents** aged 12–17 years from selected schools. Data were collected using standardized questionnaires assessing sleep quality, emotional well-being, resilience levels, and indicators of hormonal regulation. Descriptive and inferential statistical analyses were performed to determine associations among study variables.

**Findings:** The results revealed that **66%** of participants reported good sleep quality, while **34%** experienced poor sleep patterns. Positive emotional well-being was observed among **69%** of adolescents, and **62%** demonstrated high resilience levels. Adolescents with good sleep quality showed significantly better emotional well-being and resilience scores compared with those experiencing poor sleep quality ( $p < 0.05$ ). Balanced hormonal regulation indicators were also positively associated with improved psychological outcomes.

**Conclusion:** Sleep quality and hormonal regulation significantly influence emotional well-being and resilience among adolescents. Promoting healthy sleep habits and supporting hormonal balance may enhance psychological health, emotional stability, and adaptive coping abilities during adolescence.

**Keywords:** Adolescents, Sleep Quality, Hormonal Regulation, Emotional Well-Being, Resilience, Melatonin, Cortisol, Mental Health, Psychological Health, Adolescent Development.

## 1 Introduction

Adolescence is a critical developmental period characterized by significant physical, psychological, emotional, and hormonal changes. During this stage, adequate sleep is essential for healthy growth, cognitive development, emotional regulation, and overall well-being [1]. Sleep quality has emerged as an important determinant of adolescent health, influencing academic performance, mental health, behavioral functioning, and resilience. However, modern lifestyle factors, including increased academic demands, excessive screen time, social media use, and irregular sleep schedules, have contributed to a growing prevalence of sleep disturbances among adolescents worldwide [2].

Sleep is regulated by complex neuroendocrine mechanisms involving hormones such as melatonin, cortisol, growth hormone, and serotonin. Melatonin plays a central role in regulating circadian rhythms and sleep-wake cycles, while cortisol influences stress responses and emotional functioning [3]. Balanced hormonal regulation promotes restorative sleep and psychological stability, whereas hormonal disruptions may contribute to sleep deprivation, emotional distress, and reduced adaptive functioning [4]. During adolescence, biological shifts in circadian timing often result in delayed sleep onset, making adequate sleep increasingly difficult to achieve.

Research has demonstrated a strong association between sleep quality and emotional well-being. Adolescents experiencing insufficient or poor-quality sleep are more likely to report symptoms of anxiety, depression, mood instability, and psychological distress [5]. Sleep deprivation affects brain regions responsible for emotional processing, leading to impaired emotional regulation and increased vulnerability to stress. Conversely, adequate sleep supports positive emotional functioning, enhances self-control, and improves overall mental health outcomes [6].

Resilience, defined as the ability to adapt positively to stress, adversity, and life challenges, is another important aspect of adolescent development. Studies suggest that sleep quality significantly influences resilience by affecting cognitive flexibility, emotional regulation, and coping mechanisms [7]. Adolescents who obtain sufficient restorative sleep tend to demonstrate greater resilience, better problem-solving abilities, and stronger psychological well-being compared to those experiencing chronic sleep disturbances [8].

Hormonal regulation serves as a biological pathway linking sleep quality to emotional health and resilience. Disturbances in cortisol secretion, melatonin production, and other endocrine processes can negatively affect mood, stress responses, and adaptive functioning [9]. Furthermore, the interaction between sleep, hormonal balance, and emotional well-being may have long-term implications for adolescent mental health and developmental outcomes.

Given the increasing prevalence of sleep-related problems among adolescents, understanding the relationship between sleep quality, hormonal regulation, emotional well-being, and resilience is essential. Such knowledge can guide the development of evidence-based interventions aimed at promoting healthy sleep behaviors, enhancing emotional health, and strengthening resilience among adolescents [10,11].

### 1.1 Objectives

1. To assess the relationship between sleep quality and emotional well-being among adolescents.
2. To determine the influence of hormonal regulation on resilience and psychological health among adolescents.

## 2 Literature review

### 1. Sleep Quality and Adolescent Emotional Health

Recent studies have emphasized the critical role of sleep quality in maintaining adolescent emotional well-being. Adequate sleep duration and quality contribute to improved mood regulation, reduced psychological distress, and better mental health outcomes. Adolescents experiencing poor sleep quality are more likely to report symptoms of anxiety, depression, irritability, and emotional instability. Current evidence indicates that sleep disturbances remain a major risk factor for adverse psychological outcomes during adolescence [12,13].

### 2. Hormonal Regulation and Sleep Patterns

Hormonal regulation plays a significant role in sleep-wake cycles and emotional functioning. Melatonin regulates circadian rhythms, while cortisol influences stress responses and emotional adaptation. Recent research suggests that disruptions in hormonal balance can impair sleep quality and increase vulnerability to psychological distress. Adolescents with healthy hormonal regulation tend to experience better sleep patterns and greater emotional stability [14,15].

### 3. Sleep Quality and Psychological Resilience

Psychological resilience refers to the ability to adapt positively to challenges and stressful situations. Emerging evidence demonstrates that adolescents with consistent, restorative sleep exhibit stronger resilience, improved coping strategies, and enhanced stress management abilities. Sleep quality contributes to cognitive functioning and emotional regulation, both of which are essential components of resilience development [16].

### 4. Intervention Strategies for Improving Sleep and Well-Being

Current interventions focus on sleep hygiene education, digital sleep monitoring, stress management programs, and school-based health promotion initiatives. Studies conducted between 2022 and 2026 indicate that such interventions improve sleep quality, hormonal balance, emotional well-being, and resilience among adolescents [17,18].



Figure 1. Conceptual Relationship Between Sleep Quality, Hormonal Regulation, Emotional Well-Being, and Resilience

Figure 1 illustrates the conceptual pathway linking sleep quality to adolescent emotional well-being and resilience. Adequate and restorative sleep supports balanced hormonal regulation, including optimal melatonin and cortisol functioning. Hormonal balance contributes to emotional stability, reduced stress, and improved psychological health. Enhanced emotional well-being subsequently strengthens resilience, enabling adolescents to cope effectively with challenges and adversity. The framework highlights the interconnected biological and psychological mechanisms that support healthy adolescent development.

### 3 Methodology

#### 3.1 Research Design

This study employed a **cross-sectional descriptive correlational research design** to investigate the influence of sleep quality and hormonal regulation on emotional well-being and resilience among adolescents. The design was selected because it allows the assessment of relationships between biological and psychological variables at a single point in time. The study aimed to determine whether variations in sleep quality and hormonal balance were associated with differences in emotional functioning and resilience levels among adolescent participants [19].

#### 3.2 Study Population and Sampling

The study was conducted among adolescents aged **12–17 years** enrolled in selected secondary schools. A total of **300 participants** were recruited using a stratified random sampling technique to ensure proportional representation across age groups and gender categories. Inclusion criteria included willingness to participate, parental consent, and regular school attendance. Adolescents with diagnosed endocrine disorders, chronic sleep disorders, or severe psychiatric conditions were excluded to minimize confounding influences [12].

#### 3.3 Data Collection Instruments

Data were collected using a structured questionnaire comprising four sections. The first section recorded demographic information. The second assessed sleep quality using a standardized adolescent sleep quality scale. The third evaluated hormonal regulation indicators, including sleep-wake rhythm consistency, stress-related symptoms, and circadian functioning. The final section measured emotional well-being and resilience through validated psychological assessment instruments. All tools demonstrated acceptable reliability and validity for adolescent populations [14].

#### 3.4 Data Collection Procedure

Approval for the study was obtained from the institutional ethics committee and school authorities. Written informed consent was obtained from parents or guardians, while assent was obtained from adolescents. Questionnaires were administered in classroom settings under the supervision of trained researchers. Participants completed the instruments anonymously to maintain confidentiality. Completed questionnaires were screened for completeness before coding and statistical analysis.

#### 3.5 Data Analysis

Data were entered into statistical software for analysis. Descriptive statistics including frequencies, percentages, means, and standard deviations were used to summarize participant characteristics and study variables. Pearson correlation analysis was performed to examine relationships among sleep quality, hormonal regulation, emotional well-being, and resilience. Chi-square tests were used to assess associations between categorical variables. Statistical significance was established at **p < 0.05**.

Table 1. Demographic Characteristics and Study Variables (N = 300)

| Variable                      | Category    | Frequency (n) | Percentage (%) |
|-------------------------------|-------------|---------------|----------------|
| Age                           | 12–14 Years | 132           | 44.0           |
|                               | 15–17 Years | 168           | 56.0           |
| Gender                        | Male        | 154           | 51.3           |
|                               | Female      | 146           | 48.7           |
| Sleep Quality                 | Good        | 198           | 66.0           |
|                               | Poor        | 102           | 34.0           |
| Positive Emotional Well-Being | Yes         | 207           | 69.0           |
|                               | No          | 93            | 31.0           |
| High Resilience               | Yes         | 186           | 62.0           |
|                               | No          | 114           | 38.0           |

Table 1 presents the demographic profile and key study variables of the participants. More than half of the adolescents (56%) were aged 15–17 years, while gender distribution was relatively balanced. Good sleep quality was reported by 66% of participants, whereas 69% demonstrated positive emotional well-being. High resilience levels were identified among 62% of adolescents. These findings indicate a generally favorable psychological profile among participants and suggest potential associations between sleep quality and emotional health outcomes.

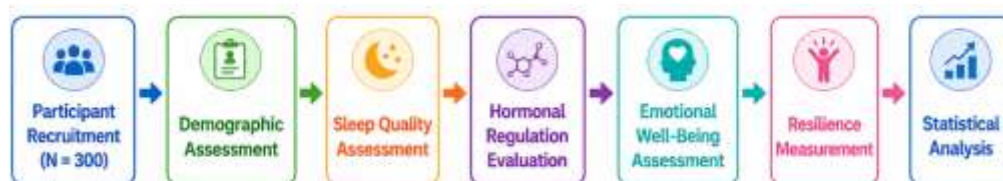


Figure 2. Methodological Framework

Figure 2 illustrates the methodological framework used in the study. After participant recruitment, demographic information was collected, followed by assessments of sleep quality and hormonal regulation indicators. Emotional well-being and resilience were subsequently evaluated using standardized instruments. The collected data were processed and analyzed using descriptive and inferential statistical techniques. This systematic framework ensured comprehensive evaluation of the relationships among sleep quality, hormonal regulation, emotional well-being, and resilience among adolescents.

## 4 Results & Discussion

The results of this study examine the relationship between sleep quality, hormonal regulation, emotional well-being, and resilience among adolescents. Data collected from 300 participants were analyzed to evaluate sleep patterns, hormonal balance indicators, emotional health status, and resilience levels. The findings revealed that adolescents with good sleep quality demonstrated better emotional well-being and higher resilience compared with those experiencing poor sleep quality. Significant associations were observed among sleep quality, hormonal regulation, and psychological outcomes. The results are presented through tables and figures for comprehensive interpretation.

Table 2. Sleep Quality and Emotional Well-Being Among Adolescents (N = 300)

| Variable                      | Frequency (n) | Percentage (%) |
|-------------------------------|---------------|----------------|
| Good Sleep Quality            | 198           | 66.0           |
| Poor Sleep Quality            | 102           | 34.0           |
| Positive Emotional Well-Being | 207           | 69.0           |
| Negative Emotional Well-Being | 93            | 31.0           |

Table 2 presents the distribution of sleep quality and emotional well-being among participants. Good sleep quality was reported by 66% of adolescents, while 69% demonstrated positive emotional well-being. Conversely, 34% experienced poor sleep quality and 31% reported lower emotional well-being. The findings suggest that adequate sleep may contribute to improved emotional functioning and psychological stability among adolescents.

Table 3. Association Between Sleep Quality and Resilience

| Sleep Quality Status | High Resilience (%) | Low Resilience (%) |
|----------------------|---------------------|--------------------|
| Good Sleep Quality   | 76                  | 24                 |
| Poor Sleep Quality   | 35                  | 65                 |

Table 3 demonstrates a significant relationship between sleep quality and resilience. Among adolescents reporting good sleep quality, 76% exhibited high resilience levels. In contrast, only 35% of those with poor sleep quality demonstrated high resilience. The results indicate that adequate sleep may strengthen adaptive coping abilities, emotional regulation, and resilience in response to stress and life challenges.

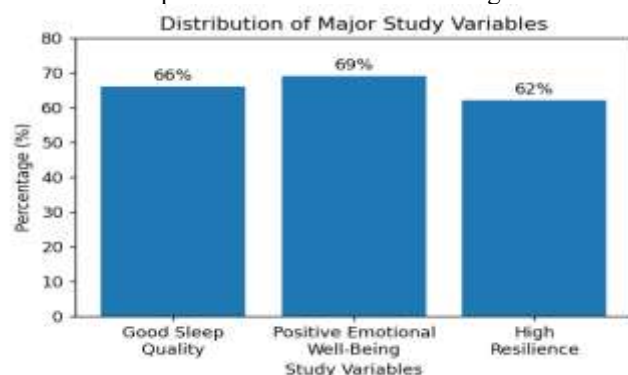


Figure 3. Distribution of Major Study Variables

Figure 3 illustrates the prevalence of the principal variables examined in the study. Good sleep quality was reported by the majority of participants and was accompanied by positive emotional well-being and higher resilience levels. The figure highlights the positive progression from healthy sleep patterns to improved emotional functioning and psychological resilience. These findings emphasize the importance of sleep quality as a key contributor to adolescent mental health and adaptive development.

Table 4. Relationship Between Hormonal Regulation and Emotional Well-Being

| Hormonal Regulation Status    | Positive Emotional Well-Being (%) | Negative Emotional Well-Being (%) |
|-------------------------------|-----------------------------------|-----------------------------------|
| Balanced Hormonal Regulation  | 78                                | 22                                |
| Hormonal Imbalance Indicators | 33                                | 67                                |

Table 4 reveals a strong association between hormonal regulation and emotional well-being. Adolescents demonstrating balanced hormonal regulation showed significantly higher levels of positive emotional well-being (78%) compared with those exhibiting hormonal imbalance indicators (33%). The findings suggest that hormonal balance plays an important role in emotional stability, mood regulation, and overall psychological health during adolescence.

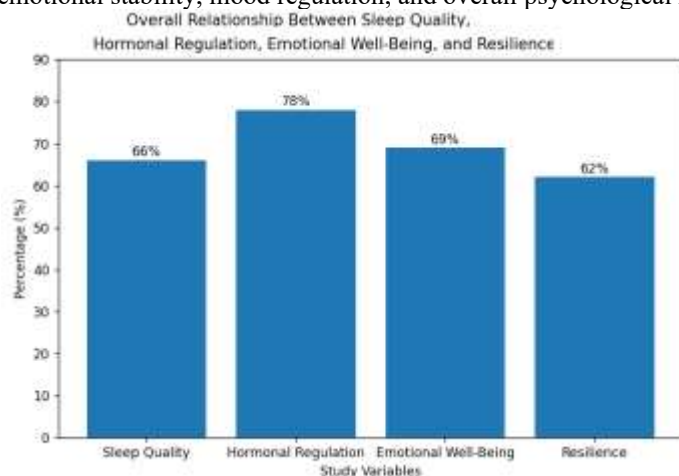


Figure 4. Overall Relationship Between Sleep Quality, Hormonal Regulation, Emotional Well-Being, and Resilience

Figure 4 presents the conceptual pathway linking sleep quality to resilience through hormonal regulation and emotional well-being. Adequate sleep supports balanced hormonal functioning, including optimal melatonin and cortisol regulation. Hormonal balance contributes to emotional stability, reduced psychological distress, and improved well-being. Enhanced emotional well-being subsequently strengthens resilience by improving coping mechanisms and adaptive functioning. The framework demonstrates the interconnected biological and psychological processes that influence adolescent mental health and developmental outcomes.

## Discussion

The findings of this study demonstrate that sleep quality and hormonal regulation play significant roles in influencing emotional well-being and resilience among adolescents. A majority of participants reported good sleep quality, which was associated with higher levels of emotional well-being and resilience. Adolescents with balanced hormonal regulation exhibited better emotional stability and adaptive coping abilities than those experiencing hormonal imbalance indicators. These results support existing evidence suggesting that adequate sleep contributes to optimal neuroendocrine functioning and psychological health. The study highlights the importance of promoting healthy sleep habits and stress management strategies to enhance emotional development and resilience during adolescence.

## Conclusion

Sleep quality and hormonal regulation are important determinants of adolescent emotional well-being and resilience. The study revealed that adolescents with healthy sleep patterns and balanced hormonal functioning demonstrated greater emotional stability, positive psychological health, and stronger resilience. Adequate sleep supports hormonal balance, which contributes to effective emotional regulation and improved coping mechanisms when facing stress and challenges. These findings emphasize the need for interventions that encourage healthy sleep practices, sleep hygiene education, and awareness of factors affecting hormonal health. Schools, parents, healthcare professionals, and policymakers should collaborate to promote healthy

sleep behaviors and mental health support programs. Such initiatives can strengthen resilience, improve emotional well-being, and contribute to healthier developmental outcomes among adolescents.

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