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Sleep medications misuse among young adults: A Review Article (A Comprehensive Narrative Review)

Marwa Younis Mohammed Khalifa
Muhanad moftah Almahmody
Ministry of Technical and Vocational Education, Libya
Higher Institute of Medical Sciences and Technology – El-Marj
Department of Pharmacy
Email: elorofymarwa1992@gmail.com

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Abstract:

Background: Recent decades have seen a steady rise in sleep medication and sedative prescribing, accompanied by a concerning increase in misuse among young adults. While opioid misuse has received widespread attention, sleep medication misuse remains relatively neglected despite its severe consequences.

Objective: To synthesize published evidence on the prevalence, risk factors, motives, sources, and consequences of sleep medication misuse among young adults (18–35 years; adolescents aged 14–17 were considered only for context), with emphasis on the pharmacist's role.

Methods: A comprehensive narrative review. PubMed, Scopus, and Google Scholar were searched for the period 2004–2026 using terms related to sleep medications, sedatives, misuse, and young adults. After screening against predefined inclusion and exclusion criteria, 21 studies from North America, Europe, and the Middle East and North Africa (MENA) region were included, comprising cross-sectional, longitudinal, systematic review, registry-based, and laboratory-based designs. Findings were synthesized narratively, without pooling, because definitions of misuse differed across studies.

Results: Reported prevalence of misuse ranged from approximately 3% among Spanish adolescents to 7.7% in a UK internet-based sample, and was 5.8% among U.S. young adults aged 18–25 years; higher figures (15–26.6%) were reported among university students in the MENA region, although direct comparison is limited by differing definitions of misuse. Misuse was associated with psychiatric disorders (2–5-fold increased risk) and with opioid misuse. More than 50% of misusers obtained medication from friends or family, while community pharmacies and self-prescription were prominent sources in MENA studies. Benzodiazepine-related deaths increased by more than 400% between 1996 and 2013, and benzodiazepines were involved in approximately 30% of opioid-related overdose deaths.

Conclusion: Sleep medication misuse among young adults is a growing, multidimensional public health concern that warrants early intervention. The available evidence suggests that pharmacists are well placed for early detection and prevention, although controlled studies of pharmacist-led interventions are still lacking.

Keywords: Sleep medication misuse, young adults, benzodiazepines, polysubstance misuse, pharmacist.

الملخص العربي:

الخلفية: شهدت العقود الأخيرة ارتفاعاً مطرداً في وصف أدوية النوم والمهدئات، ورافق ذلك زيادة مقلقة في إساءة استخدامها بين الشباب. ورغم أن إساءة الأفيونات حظيت باهتمام واسع، إلا أن إساءة أدوية النوم لا تزال مهملة نسبياً رغم عواقبها الوخيمة.

الهدف: تجميع الأدلة المنشورة حول انتشار إساءة أدوية النوم بين الشباب (18-35 سنة، مع مراعاة المراهقين 14-17 سنة لأغراض السياق)، وعوامل الخطر، والدوافع، ومصادر الحصول، والعواقب، مع التركيز على دور الصيدلي.

المنهجية: مراجعة سردية شاملة. أُجري بحث في PubMed وScopus وGoogle Scholar للفترة 2004-2026 باستخدام مصطلحات تتعلق بأدوية النوم والمهدئات وإساءة الاستخدام والشباب. بعد الفرز وفق معايير إدراج واستبعاد محددة، أُدرجت 21 دراسة من أمريكا الشمالية وأوروبا ومنطقة الشرق الأوسط وشمال أفريقيا، بتصاميم متنوعة (مقطعية، طولية، مراجعات منهجية، دراسات سجلات ومختبرية). عُرضت النتائج سردياً دون تجميع إحصائي بسبب اختلاف تعريفات الإساءة.

النتائج: تراوحت معدلات الإساءة المبلغ عنها بين نحو 3% لدى المراهقين في إسبانيا و7.7% في عينة بريطانية عبر الإنترنت، وبلغت 5.8% لدى الشباب الأمريكيين (18-25 سنة)، بينما سُجلت نسب أعلى (15-26.6%) بين طلاب الجامعات في منطقة الشرق الأوسط، مع التنبيه إلى أن المقارنة المباشرة غير ممكنة بسبب اختلاف التعريفات. ارتبطت الإساءة بالاضطرابات النفسية (خطر أعلى بمقدار 2-5 أضعاف) وبإساءة استخدام الأفيونات. حصل أكثر من 50% من المسيئين على الأدوية من الأصدقاء والعائلة، وبرزت الصيدليات المجتمعية والوصف الذاتي مصدراً شائعاً في دراسات المنطقة. ارتفعت وفيات البنزوديازيبينات بأكثر من 400% بين 1996 و2013، وارتبطت بنحو 30% من وفيات جرعات الأفيونات الزائدة.

الخلاصة: تمثل إساءة أدوية النوم بين الشباب مشكلة صحية عامة متعددة الأبعاد ومتنامية تستدعي تدخلات مبكرة، وتشير الأدلة المتاحة إلى أن الصيدلي في موقع مناسب للكشف المبكر والوقاية، مع الحاجة إلى دراسات تجريبية تقيّم فعالية تدخلاته.

الكلمات المفتاحية: إساءة أدوية النوم، الشباب، البنزوديازيبينات، تعدد الإساءة، الصيدلي.

1. Introduction

Sleep is not simply the absence of wakefulness. It is an active, highly organized biological process that touches virtually every system in the body (Walker, 2017). In the context of young adulthood a developmental phase typically spanning from the late teens to the early thirties healthy sleep serves as the fundamental cornerstone of both physical and psychological resilience. During this period, the brain undergoes significant neuroplastic changes, making the restorative functions of sleep particularly critical for cognitive and emotional stability (Šljivo et al., 2022).

From a neurobiological perspective, sleep is governed by the intricate interplay between two primary systems: the circadian rhythm (Process C) and the homeostatic sleep drive (Process S) (Borbély et al., 2016). The circadian rhythm, regulated by the suprachiasmatic nucleus in the hypothalamus, synchronizes internal biological clocks with the external 24hour light dark cycle. For young adults, this system is often subject to a phase delay, a biological tendency toward later sleep and wake times, which frequently clashes with the rigid schedules of academic and professional institutions (Carskadon, 2011). In addition, the homeostatic sleep drive builds sleep pressure throughout the day, primarily through the accumulation of adenosine in the brain. Adequate sleep is the only mechanism through which this pressure is relieved, allowing for the restoration of cognitive and metabolic functions (Dijk & Landolt, 2019).

One of the most significant recent discoveries in sleep science is the role of the glymphatic system. This macroscopic waste clearance system becomes highly active during deep sleep, utilizing perivascular channels to flush out metabolic byproducts and neurotoxic proteins, such as beta amyloid, from the brain's parenchyma (Xie et al., 2013; Jessen et al., 2015). For young adults, whose brains are still in a state of high metabolic activity and structural refinement, this nocturnal cleaning is vital for preventing neuroinflammation and ensuring long term neurocognitive health (Nedergaard & Goldman, 2020).

As described by Giedd (2004), early adulthood represents a unique neurodevelopmental window. While in early adolescence the brain reaches its maximum size, the process of structural and functional refinement continues until the third decade of life. And the most notable change during this period is the maturation of the Prefrontal Cortex (PFC) the area responsible for executive functions, including complex decision making, impulse control, and emotional regulation (Giedd, 2004).

Healthy sleep also powers this maturation process. During Rapid Eye Movement (REM) sleep the brain engages in intensive memory consolidation and emotional processing, while Non REM (NREM) sleep facilitates the pruning of inefficient neural connections (Walker & Stickgold, 2006). Yoo et al. (2007) showed that when sleep is chronically insufficient, the bidirectional communication between the PFC and the amygdala (the brain's emotional center) is compromised. This disruption manifests as increased emotional lability, a diminished capacity for rational judgment, and a heightened vulnerability to risk taking behaviors. Consequently, the sleep deprived young adult is not only cognitively impaired but is also biologically less equipped to manage the stressors of early independent life (Hartwell et al., 2014).

Despite its biological necessity, sleep is increasingly under siege in modern society. We are currently witnessing what researchers describe as a global Sleep Recession, particularly among the youth (Šljivo et al., 2022). This crisis is driven by a confluence of technological, social, and economic factors that have fundamentally altered the human relationship with darkness and rest.

The ubiquity of digital technology is perhaps the most pervasive driver of sleep disruption. The blue light emitted by smartphones, tablets, and laptops suppresses the natural secretion of melatonin, the hormone that signals the body to prepare for sleep (Chang et al., 2015). Beyond the physiological impact, the psychological phenomenon of Fear of Missing Out (FOMO) and the addictive nature of social media algorithms lead to bedtime procrastination, where individuals delay sleep to engage in digital consumption (Scott & Woods, 2018).

Additionally, the prevailing culture of hard work in academic and corporate environments has framed sleep deprivation as a badge of honor and a symbol of excellence and dedication. In highly competitive university environments, staying up all night is often normalized, creating a systemic environment where rest is considered a luxury rather than a necessity. This low cultural valuation of sleep, along with the blurring of boundaries between work and home life, has caused a state of hyperarousal among young people, making the transition to normal sleep increasingly difficult.

The consequences of this sleep crisis extend far beyond the individual, posing a significant burden on public health systems and the global economy. Chronic sleep insufficiency is a potent risk factor for a spectrum of non communicable diseases. Longitudinal epidemiological studies have established clear links between short sleep duration and the development of hypertension, cardiovascular disease, Type 2 diabetes, and metabolic syndrome (Itani et al., 2017). In young adults, these risks may not manifest immediately as clinical disease, but they lay the physiological groundwork for premature morbidity in later life (Grandner, 2017).

The mental health implications are equally profound. There is a robust, bidirectional relationship between sleep disturbances and psychiatric disorders. Insomnia is often a precursor to major depressive disorder and generalized anxiety, while these conditions, in turn, exacerbate sleep difficulties (Baglioni et al., 2011). In a demographic already facing a mental health epidemic, the loss of sleep acts as a force multiplier for psychological distress.

From an economic perspective, the costs of sleep deprivation are staggering. Reduced productivity, increased absenteeism, and the heightened risk of workplace and motor vehicle accidents contribute to billions of dollars in annual losses (Hafner et al., 2016). For the young adult student or professional, the cognitive deficits associated with poor sleep such as impaired attention, reduced creativity, and slower information processing can significantly hinder academic achievement and career trajectory, leading to long term socioeconomic disadvantages.

In the face of these overwhelming biological and social pressures, young adults are increasingly seeking rapid solutions to their sleep difficulties. The desire for a quick fix to overcome insomnia and maintain high levels of performance has led to a surge in the use of pharmacological aids (Wang et al., 2023). However, this shift from natural rest to chemically induced sedation is fraught with clinical risks.

Many young adults, lacking adequate health literacy or access to professional guidance, turn to self medication. This behavior often involves the misuse of prescription sedatives (such as benzodiazepines and Z drugs) or the over reliance on over the counter (OTC) antihistamines and supplements (Votaw et al., 2019). The transition from occasional use to chronic dependency is a subtle but dangerous path, characterized by the development of tolerance, rebound insomnia, and the potential for lethal drug interactions (Schepis et al., 2018).

This review aims to explore the multifaceted nature of sleep medication misuse among young adults, analyzing the pharmacological mechanisms, the socio psychological drivers, and the clinical consequences of this burgeoning public health crisis. By synthesizing global and regional evidence, we seek to provide a comprehensive framework for early detection, prevention, and intervention.

2. Problem and Research Gaps

For the past two decades, the global public health landscape has been dominated by the opioid epidemic. While the focus on opioid related morbidity and mortality is undeniably justified given the

scale of the crisis, it has inadvertently cast a long shadow over other significant classes of prescription drug misuse. Specifically, the misuse of tranquilizers and sedatives medications primarily intended for the management of sleep and anxiety disorders has received considerably less attention from researchers, policymakers, and funding agencies (Votaw et al., 2019).

This knowledge gap is particularly concerning because the epidemiological trajectory of sedative misuse often parallels or intersects with opioid use. Data indicates that benzodiazepines and Z drugs contribute substantially to overdose related mortality, both independently and in combination with other central nervous system (CNS) depressants. In 2015, approximately 30% of all opioid related overdose deaths in the United States also involved benzodiazepines (Tubbs et al., 2022). Despite these alarming figures, the scientific community has been slower to develop targeted interventions and comprehensive monitoring programs for sleep medication misuse, especially in younger populations.

Methodological Heterogeneity: A critical barrier to understanding the true prevalence and impact of sleep medication misuse is the lack of a standardized methodological framework. Research in this field is characterized by significant variability in the definitions of misuse, the drug classes included in each analysis, and the age ranges targeted by investigators.

Some studies adopt a narrow definition of misuse, focusing solely on non prescribed usethe acquisition of medication from sources other than a physician, such as friends or family (social sourcing) (Milani et al., 2020). Conversely, other researchers utilize the broader definition established by the National Survey on Drug Use and Health (NSDUH) since 2015, which encompasses any use not directed by a physician, including dose escalation, increased frequency of use, or use for non therapeutic purposes like achieving euphoria (Blanco et al., 2018; Schepis et al., 2018). This lack of definitional consistency renders cross study comparisons challenging and complicates the ability of public health authorities to derive unified conclusions or implement evidence based policies (Votaw et al., 2019).

Therapeutic use versus misuse. For the purposes of this review, therapeutic use refers to the use of a sleep medication for its labelled indication, at the prescribed or labelled dose and duration, as directed by a clinician or product label. Misuse refers to any use of a prescription or over-the-counter (OTC) sleep medication without a prescription, or in a manner, dose, frequency, duration, or for a purpose (e.g., euphoria, performance enhancement, or combination with alcohol or other central nervous system depressants) other than that directed. Misuse is distinguished from a substance use disorder, which additionally requires a pattern of impaired control, craving, tolerance, and withdrawal that causes clinically significant impairment. Prevalence figures in this review are reported as defined by the original authors and are not pooled; they should therefore be interpreted as indicative ranges rather than directly comparable estimates.

As for the misuse of sleep medications, there is a clear geographical variation in the current literature and scientific studies. Most of the published data comes from North America, with a smaller but significant body of research from Europe and Australia. While information from Asia, especially from the Middle East and North Africa (MENA) region, remains notably scarce, one might conclude that there are no government records on the subject (Alshahrani et al., 2026).

This geographic bias is not merely a matter of data collection; it represents a fundamental gap in our understanding of how different regulatory environments and cultural attitudes influence drug taking behavior. In many MENA countries, for instance, a historical pharmacy culture of self medication persists, and the social stigma surrounding psychiatric consultation may drive young adults toward pharmacological self treatment for insomnia (Alasmari, 2022). Without localized data, public health interventions designed in Western contexts may fail to address the specific socio cultural drivers of misuse in other regions.

While extensive research has examined the roles of prescribing physicians and government mandated Prescription Drug Monitoring Programs (PDMPs), the role of the community pharmacist remains in its infancy. As the most accessible healthcare provider, the pharmacist is uniquely positioned at the point of dispensing to identify early signs of misuse, such as frequent refill requests or attempts at pharmacy shopping (Algarni et al., 2021).

However, scientific understanding of how pharmacists can effectively intervene, counsel, and educate young adults regarding the risks of sleep medication is limited. Most existing intervention studies have focused on the clinical management of chronic pain and opioid use, leaving a significant

void in the development of pharmacist led protocols for the prevention of sedative and hypnotic misuse. Addressing this gap is essential for creating a truly integrated healthcare response to the crisis.

The Need for the Present Review:

Given these critical gaps, there is an urgent need for a comprehensive narrative review that synthesizes global evidence while specifically addressing the unique challenges faced by young adults. This review seeks to bridge the methodological and geographic divides by integrating findings from diverse cultural contexts and emphasizing the pharmacological, psychological, and systemic drivers of misuse. By doing so, we aim to provide a robust framework that informs clinical practice, university policy, and future research directions.

3. Methodology

This study is a comprehensive narrative review of the evidence on the misuse of sleep medications among young adults. Reporting followed the recommendations of the SANRA scale for narrative reviews (Baethge et al., 2019), and the study-selection process is documented in the style of the PRISMA 2020 flow diagram (Page et al., 2021) (Table 1). Because of the heterogeneity of study designs and definitions of misuse, no meta-analysis was attempted and findings were synthesized narratively.

3.1 Search strategy

Three databases (PubMed, Scopus, and Google Scholar) were searched for the period January 2004 to July 2026. The core search string combined four concept blocks: (1) sleep medications: "sleep medication*" OR "sleeping pill*" OR hypnotic* OR sedative* OR tranquilizer* OR benzodiazepine* OR "Z-drug*" OR zolpidem OR diphenhydramine OR melatonin; (2) misuse: misuse OR "non-medical use" OR nonmedical OR abuse OR "self-medication"; (3) population: "young adult*" OR adolescent* OR "college student*" OR "university student*"; and (4) optionally, pharmacist* OR "community pharmacy" for the section on the pharmacist's role. Search syntax was adapted to each database. In Google Scholar, the first (84) results of each query were screened. The reference lists of included studies and relevant reviews were also hand-searched.

3.2 Eligibility criteria

Inclusion criteria: (i) studies of young adults (typically 18–35 years) or students in higher education; studies of adolescents aged 14–17 years were included only where they provided developmental context for the initiation of misuse; (ii) studies addressing the misuse of prescription sedative-hypnotics (benzodiazepines and Z-drugs), OTC sleep aids (first-generation antihistamines), or melatonin; (iii) studies reporting prevalence, motives, sources of acquisition, risk factors, clinical consequences, or prevention strategies; and (iv) original studies, systematic reviews, and registry- or laboratory-based studies published between 2004 and 2026 in English.

Exclusion criteria: (i) studies focused exclusively on older adults or on clinical populations using sleep medication under supervision, with no data on misuse; (ii) studies of illicit drugs or stimulants with no sedative-hypnotic data; (iii) case reports, editorials, conference abstracts, and commentaries; and (iv) studies in which misuse could not be distinguished from therapeutic use. Where the same dataset was reported in more than one publication, the most complete report was retained.

3.3 Study selection and data extraction

Records were screened by title and abstract, followed by full-text assessment against the eligibility criteria. Screening was performed independently by one author, verified by a second , and disagreements were resolved by discussion . For each included study, the following were extracted: country, population and age range, design, definition of misuse, drug class, prevalence, motives, sources of acquisition, risk factors, and outcomes. A formal risk-of-bias assessment was not performed, which is acknowledged as a limitation (Section 12). The selection process is summarized in Table 1, and the principal prevalence studies are summarized in Table 2.

3.4 Population and definition of age groups

To resolve inconsistent age definitions across the literature, this review defines young adults as individuals aged 18–35 years, a period characterized by major life transitions and continuing neurobiological maturation. Wherever a cited study used a narrower or different age window (for

example, 18–25 years in the U.S. National Survey on Drug Use and Health, or 14–18 years in the Spanish school survey), the original age range is stated explicitly in the text.

Table 1. Study selection process

Stage	Number of records
Records identified through database searching (PubMed, Scopus, Google Scholar)	84
Additional records from reference lists	0
Records after duplicates removed	67
Records screened by title/abstract	51
Full-text articles assessed for eligibility	35
Full-text articles excluded (with reasons)	14
Studies included in the narrative synthesis	21

Table 2. Principal studies contributing prevalence and source data discussed in Section 5 (a subset of the 21 included studies)

Study	Country / setting	Population	Design / data source	Key finding
Schepis et al., 2018	United States	Young adults 18–25 years	National survey (NSDUH)	5.8% past-year misuse; highest of all age groups
Carrasco-Garrido et al., 2018	Spain	Secondary school students (>179,000)	National school surveys, 2004–2014	Misuse rose from 2.40% to ~3.0%; higher in females
Kapil et al., 2014	United Kingdom	General adult sample	Internet-based survey	7.7% misused benzodiazepines/Z-drugs
Lehne et al., 2018	Seven European countries	University students	Cross-national survey	Perceived peer use predicted misuse
Stangeland et al., 2023	Norway	Children and young adults	Dispensing registry, 2004–2019	Fall in benzodiazepine dispensing; rise in melatonin
Alasmari, 2022	Saudi Arabia	Medical students	Cross-sectional	26.6% misuse as reported in this review; self-prescription common
Alfarhan, 2024	Saudi Arabia (Jazan)	University students	Cross-sectional	OTC sleep-aid use >56%, mainly diphenhydramine
Saaed, 2026	Egypt	Medical students	Survey (preprint)	Sedative use linked to poor sleep quality and family income
Fadhel et al., 2022	Lebanon	University students	Pilot study	~15% non-medical sedative use; social sourcing
Votaw et al., 2019	Multiple	Mixed	Systematic review	Benzodiazepine prescribing and misuse trends

4. Pharmacological Classification and Mechanisms of Action

To understand the public health crisis of sleep medication misuse, it is imperative to first delineate the pharmacological landscape of the substances involved. Sleep medications, or sedative hypnotics, are not a monolithic group; they comprise several distinct chemical classes that interact with the central nervous system (CNS) through diverse molecular pathways. The risks of misuse, the potential for addiction, and the severity of side effects are all intrinsically linked to these specific pharmacological properties.

4.1 The GABAergic System: (The Primary Target)

Most prescribed sleep medications target the gamma aminobutyric acid (GABA) system, which is the main network of inhibitory neurotransmitters in the brain. GABA receptors, specifically the GABA-A subtype, are ligand gated ion channels, and when activated, they allow chloride ions to enter the neuron, leading to hyperpolarization and a subsequent decrease in neuronal excitability.

1. **Benzodiazepines (BZDs):** Benzodiazepines, including Alprazolam (Xanax), Diazepam (Valium), Lorazepam (Ativan), and Temazepam (Restoril), have been clinical staples for decades. They act as positive allosteric modulators of the GABA-A receptor: instead of occupying the GABA binding site, they bind to a distinct benzodiazepine site at the interface between the α and γ subunits. This binding increases the frequency of the chloride channel opening in response to GABA, thereby enhancing its inhibitory effect (Votaw et al., 2019).
   Risks of Misuse: Because BZDs bind non selectively to various GABA-A receptor subunits (α1, α2, α3, and α5), they produce a broad range of effects, including sedation, anxiolysis, muscle relaxation, and anticonvulsant activity. This non selectivity is also the source of their high misuse potential; young adults may seek the anxiolytic or euphoric effects (α2/α3 mediated) just as much as the sedative effects (α1 mediated). Chronic use leads to the down regulation of these receptors, necessitating higher doses to achieve the same effect a hallmark of physiological tolerance (Blanco et al., 2018).
2. **Non Benzodiazepine Hypnotics (Z-drugs):** Z-drugs, such as Zolpidem (Ambien), Zopiclone, and Eszopiclone (Lunesta), were developed in the 1980s and 90s with the intent of creating safer alternatives to traditional BZDs. While they also act on the GABA-A receptor, they are characterized by their subunit selectivity, specifically targeting the α1 subunit. This selectivity is intended to provide potent sedative effects while minimizing the muscle relaxant and anxiolytic side effects associated with BZDs (Wang et al., 2023; Ellis et al., 2024).
   Risks of Misuse: Despite their initial marketing as having lower abuse potential, clinical evidence has shown that Z-drugs are frequently misused. Their rapid onset of action and short half life can lead to a rebound effect, where the brain experiences acute hyperexcitability as the drug wears off, driving the user to take another dose. Furthermore, Z-drugs have been associated with complex sleep behaviors (parasomnias), such as sleepwalking and sleep-eating, which can be life-threatening when users drive or perform other hazardous activities while sedated (Stangeland et al., 2023).

4.2 Histaminergic and Anticholinergic Pathways: The OTC Domain

A significant portion of sleep medication misuse among young adults involves Over the Counter (OTC) antihistamines, such as Diphenhydramine (Benadryl) and Doxylamine (Unisom). These drugs were not originally designed as sleep aids but are marketed as such due to their potent sedative side effects.

- **Mechanism of Action:** These substances act as H1 receptor antagonists. Histamine is a vital neurotransmitter in the brain's arousal system, promoting wakefulness and alertness. By blocking H1 receptors in the tuberomammillary nucleus and other arousal centers, these drugs induce drowsiness. However, most first generation antihistamines are also anticholinergic, meaning they block acetylcholine receptors throughout the body (Algarni et al., 2021).
- **Risks of Misuse:** Because these drugs are available without a prescription, young adults often perceive them as safe and may exceed recommended doses significantly. High dose misuse can lead to anticholinergic toxicity, characterized by tachycardia, urinary retention, blurred vision, and in severe cases, delirium and hallucinations. Furthermore, their long half lives often result in significant daytime grogginess or a hangover effect, which can severely impair academic performance and cognitive functioning (Alfarhan, 2024).

4.3 Melatonin and Circadian Regulators

Melatonin is a hormone naturally secreted by the pineal gland in response to darkness, signaling the body that it is time to sleep. Exogenous melatonin and melatonin receptor agonists (like Ramelteon) mimic this natural process.

- **Mechanism of Action:** Melatonin binds to MT1 and MT2 receptors in the suprachiasmatic nucleus. MT1 activation is associated with the inhibition of neuronal firing (promoting sleep onset), while MT2 activation is involved in the phase shifting of the circadian rhythm.
- **Risks of Misuse:** While melatonin is generally considered low risk compared to BZDs, its misuse is growing. Young adults often use high doses (10mg+) to overcome the effects of blue light from screens. The long term impact of high dose exogenous melatonin on the endogenous endocrine system, particularly in the developing bodies of young adults, remains a subject of ongoing research (Stangeland et al., 2023; Ayyash et al., 2026).

4.4 Summary Classification Table

The following table provides a comprehensive summary of the primary classes of sleep medications, their mechanisms, and their associated risks.

Drug Class	**Primary Mechanism**	**Common Examples**	**Misuse Risk Profile**
Benzodiazepines	GABA-A Allosteric Modulator (Non-selective)	Alprazolam, Diazepam, Lorazepam	High: Tolerance, physical dependence, severe withdrawal
Z-drugs	GABA-A α1 Subunit Selective Agonist	Zolpidem, Zopiclone, Eszopiclone	Moderate to High: Parasomnias, rapid tolerance, rebound insomnia.
OTC Antihistamines	H1-Receptor Antagonist & Anticholinergic	Diphenhydramine, Doxylamine	Moderate: Anticholinergic toxicity, residual sedation, perceived safety bias.
Melatonin Agonists	MT1 & MT2 Receptor Agonist	Melatonin, Ramelteon	Low: Endocrine disruption at high doses, psychological reliance.
Dual Orexin Receptor Antagonists (DORAs)	Orexin-1 & Orexin-2 Antagonist	Suvorexant, Lemborexant	Low to Moderate: Emerging class; risks of next-day somnolence.

5. Global Prevalence and Epidemiological Trends

The epidemiological landscape of sleep medication misuse among young adults has undergone a dramatic transformation over the past two decades. What was once considered a secondary issue in the shadow of illicit drug use has emerged as a significant public health concern, characterized by escalating prescription rates and a parallel rise in non medical use. This section synthesizes current data to provide a comprehensive overview of how this phenomenon manifests across different global and regional contexts.

In North America, the United States provides the most robust longitudinal data regarding the misuse of tranquilizers and sedatives. The trajectory of prescribing patterns offers a clear indication of the growing reliance on pharmacological sleep aids. Between the mid 1990s and 2013, the number of benzodiazepine prescriptions in the U.S. increased by 67%, but more alarmingly, the total quantity of doses prescribed—measured in daily dose equivalents—tripled during the same period (Votaw et al., 2019).

Among young adults aged 18 to 25, the prevalence of misuse is particularly striking. According to the National Survey on Drug Use and Health (NSDUH), 5.8% of young adults in this age cohort reported misusing tranquilizers or sedatives in the past year—the highest prevalence across all age

groups studied (Schepis et al., 2018). Perhaps the most telling indicator of the depth of the problem is that nearly 43% of all young adults who used these medications reported engaging in some form of misuse, such as using a dose higher than prescribed or using medication obtained from a non-medical source (Schepis et al., 2018). Recent national estimates from 2026 further refine this picture, suggesting that approximately 681,000 U.S. adults specifically misuse sedatives for the primary purpose of inducing sleep (Tam et al., 2026).

In Europe, the prevalence of sleep medication misuse reflects a complex interplay between cultural attitudes and varying regulatory environments. In Spain, a massive national survey encompassing over 179,000 secondary school students tracked a statistically significant rise in the misuse of tranquilizers and sleeping pills, from 2.40% in 2004 to nearly 3.0% in 2014, with consistently higher rates observed among females (Carrasco-Garrido et al., 2018).

More specifically in the United Kingdom, internet based research has indicated that approximately 7.7% of the population has misused benzodiazepines or Z-drugs, with 15% of these individuals doing so on a weekly or more frequent basis (Kapil et al., 2014). In contrast, Scandinavian countries like Norway have seen a slight decline in traditional benzodiazepine dispensing to young adults due to stricter clinical guidelines; however, this has been offset by a dramatic surge in the use of melatonin and other natural aids among adolescents and young adults, raising new concerns about long term hormonal impacts (Stangeland et al., 2023). A cross national study of university students in seven European countries further highlighted that perceived peer use is a strong predictor of individual misuse, suggesting a significant normalization of these behaviors within student cultures (Lehne et al., 2018).

As numerous research gaps have indicated, the Middle East and North Africa region has historically suffered from a lack of attention and representation in global literature regarding substance abuse. However, emerging data for the period between 2022 and 2026 reveal an escalating crisis among university students in the region a crisis often fueled by unique social, cultural, and organizational factors.

In Arabic world, especially in the Kingdom of Saudi Arabia, the misuse of sleep aids among university students is a growing concern, particularly within high stress academic disciplines. A 2022 study involving medical students found a misuse prevalence of 26.6%, with self prescription being the most common behavior (Alasmari, 2022). More recent data from 2024 and 2026 indicates that over 56% of students at certain universities have utilized over the counter (OTC) sleep aids, primarily diphenhydramine, to cope with academic stress and sleep disturbances (Alfarhan, 2024; Alshahrani et al., 2026). The perceived safety of OTC products and the ease of access in community pharmacies remain significant drivers of this trend.

In Egypt, research among medical students has highlighted a prevalence of sedative drug use that correlates with higher family income and the presence of chronic sleep disorders, with some reports suggesting that up to 73% of students suffer from poor sleep quality (Saaed, 2026). In Lebanon and Jordan, studies have identified that approximately 15% of university students engage in the non medical use of sedatives, often obtaining them through social sourcing—friends or family members who share their own prescriptions (Fadhel, 2022; Ayyash et al., 2026).

In all regions, certain demographic patterns emerge. While recreational substance misuse is traditionally associated with males, the misuse of sleep medications for functional purposes (i.e., to manage stress or induce sleep) often shows a higher prevalence among females. For instance, the Spanish national survey found that 3.51% of females engaged in misuse compared to 2.18% of males (Carrasco-Garrido et al., 2018). Furthermore, the transition from adolescence to young adulthood (the 18-25 age window) appears to be the peak period for the initiation and escalation of misuse, as individuals face the dual pressures of increased academic autonomy and the onset of adult onset psychiatric symptoms.

Summary Table: Global Prevalence Comparison

Country/Region	Population Group	Prevalence Rate	Primary Source of Acquisition
United States	Young Adults (18-25)	5.8%	Friends/Family (Social Sourcing)

United Kingdom	General Adult Pop	7.7%	Internet/Social Sourcing
Spain	Adolescents (14-18)	2.96%	Family Medicine Cabinet
Saudi Arabia	Medical Students	26.6%	Self-Prescription/Pharmacies
Egypt	Medical Students	High (Linked to Stress)	Community Pharmacies
Lebanon	University Students	15.1%	Friends/Family

6. Motivations and Drivers of Misuse

The transition to early adulthood is characterized by a confluence of developmental challenges, including the pursuit of higher education, the commencement of career paths, and the formation of independent social identities. These pressures (compounded by a modern environment that often undervalues rest) create fertile ground for the onset of sleep medication misuse; consequently, understanding the underlying motivations and causes of this behavior is crucial for developing effective prevention strategies.

- **Academic Pressure and the Performance Myth:** For young adults in higher education, academic stress is arguably the most potent driver of sleep medication misuse. The prevailing hustle culture within universities often equates sleep deprivation with dedication, intelligence, and future success. This environment fosters a cycle of substance use known as the Uppers and Downers cycle. Students may utilize stimulants (such as excessive caffeine or non-medical use of prescription ADHD medications like Adderall) to maintain alertness during extended study sessions or to pull all nighters. Subsequently, when the physiological need for sleep arises but the brain remains in a state of hyper arousal, students turn to sedatives or Z-drugs to crash and obtain a few hours of rest before an exam (Waqas et al., 2015). This pattern is particularly prevalent among medical and pharmacy students, who may have greater knowledge of pharmacology but also face disproportionately high academic burdens (Alasmari, 2022; Saaed, 2026). The misuse is often framed by the students not as drug abuse, but as a necessary tool for academic survival—a phenomenon described as functional misuse.
- **Psychological Distress and Self Medication:** The early youth stage is considered a peak period for the emergence of psychological disorders, including severe depression and generalized anxiety disorder. Many young adults misuse sleep medications as a form of self medication to manage underlying psychological distress. For individuals suffering from anxiety, the rapid sedative and anxiolytic effects of benzodiazepines provide a temporary but powerful reprieve from racing thoughts and emotional turmoil. Similarly, those experiencing depressive symptoms may use sedatives to induce sleep as a way to escape from painful emotional states during the day (Schepis et al., 2018). Research has shown that individuals with higher levels of neuroticism or those who lack effective coping mechanisms for stress are significantly more likely to engage in the non-medical use of sedatives (Rigg & Ford, 2014). The immediate relief provided by these drugs creates a powerful reinforcement loop, leading to psychological reliance even before physical dependence develops.
- **Social Sourcing and the Normalization of Misuse:** The social environment of young adults, particularly in university dormitories and shared housing, plays a critical role in the initiation of misuse. Social sourcing (obtaining medication from friends, roommates, or family members) is the primary pathway to acquisition for over 50% of young adult misusers (Milani et al., 2020). This pill sharing culture leads to the normalization of misuse. When a peer offers a sleep aid to a friend struggling with exam related insomnia, the perceived risk of the drug is significantly diminished. This medication is perceived as a safe medical product rather than an addictive substance. Furthermore, the belief that one's peers use the drug is one of the strongest predictors of its misuse; students who believe their friends use sleep aids are far more likely to start using them themselves, regardless of any actual clinical need. (Lehne et al., 2018).
- **Digital Culture and Bedtime Procrastination:** The modern digital landscape has fundamentally altered the sleep wake cycle of young adults. The phenomenon of Revenge Bedtime Procrastination where individuals stay up late to engage in leisure activities (such as scrolling through social media or gaming) to compensate for a lack of control over their daytime schedule is a major contributor to insomnia. Social media platforms, through their addictive algorithms and the Fear of Missing Out

(FOMO), keep young adults in a state of cognitive arousal late into the night. When the inevitable sleep onset latency (the time it takes to fall asleep) is prolonged by the blue light of screens and psychological stimulation, individuals may feel desperate for a quick pharmacological solution to ensure they can function the next morning (Scott & Woods, 2018). The digital environment also provides easier access to information and sometimes the drugs themselves through unregulated online marketplaces, bypassing traditional medical gatekeepers.

- **Perceived Safety and Medical Legitimacy:** The medical halo effect is one of the key factors contributing to the misuse of sleep medications. Because these drugs are manufactured by pharmaceutical companies and prescribed by doctors, young people often perceive them as safer than illicit drugs like heroin or cocaine. This perception is particularly strong for over the counter (OTC) antihistamines and melatonin, which are available without a prescription and are often marketed as natural or non habit forming (Algarni et al., 2021). This false sense of security lowers the threshold for individuals to begin misusing the substance and increases the likelihood of exceeding recommended dosages; young people may underestimate the risks of respiratory depression, cognitive impairment, and fatal interactions with alcohol, believing that a product available in pharmacies carries minimal risk (Alfarhan, 2024).

7. Consequences of Sleep Medication Misuse

The impact of sleep medication misuse among young people is multifaceted, extending far beyond the drugs' direct pharmacological effects. Although these medications may offer temporary relief from insomnia, their improper use—characterized by high dosages, chronic consumption, and dangerous drug combinations—can entail serious risks capable of altering an individual's developmental trajectory and affecting their long-term health.

7.1 Physical Health and Safety Risks

- **Respiratory Depression and Lethal Overdose:** The most acute and life threatening consequence of sedative hypnotic misuse is central nervous system (CNS) depression, which can lead to significant respiratory impairment. Benzodiazepines and Z drugs, by enhancing GABAergic inhibition, can suppress the brainstem's respiratory drive. This risk is exponentially increased when these substances are co ingested with other CNS depressants, particularly alcohol or opioids. Epidemiological data reveal a grim reality in the United States, showing that nearly 30% of all opioid-related overdose deaths also involved the presence of benzodiazepines in the bodies of the deceased (Tubbs et al., 2022). Furthermore, between 1996 and 2013, benzodiazepine related deaths increased by more than 400%, a trend that mirrors the rise in prescription volume and subsequent misuse (Votaw et al., 2019). For young adults, who often engage in polysubstance use in social settings, the lack of awareness regarding these synergistic lethal effects is a major public health concern.
- **Disruption of Sleep Architecture**: Ironically, the chronic misuse of sleep aids often exacerbates the very condition they were intended to treat; natural sleep consists of distinct cycles—comprising non-rapid eye movement (NREM) and rapid eye movement (REM) sleep—each serving specific restorative functions. Most hypnotic and sedative drugs—particularly benzodiazepines (BZDs)—alter this natural sleep pattern by suppressing REM sleep and deep slow-wave sleep (Stage N3). This results in sleep that is pharmacologically induced but physiologically fragmented and unrestrictive. Upon attempting to discontinue the medication, individuals frequently experience rebound insomnia—an acute worsening of sleep quality that is often more severe than the original disturbance. This phenomenon creates a powerful withdrawal trap, where the user continues to misuse the drug simply to avoid the distress of sleeplessness (Stangeland et al., 2023).
- **Parasomnias and Complex Sleep Behaviors**: Z drugs (such as Zolpidem) are uniquely associated with complex sleep behaviors or parasomnias. These episodes occur when an individual experiences incomplete arousal during deep sleep, leading to the performance of activities without conscious awareness. Reported behaviors include sleepwalking, sleep eating, and even sleep driving. For young adults, these behaviors pose significant safety risks, leading to falls, injuries, and motor vehicle accidents. In 2019, the U.S. Food and Drug Administration required boxed warnings for zolpidem, zaleplon, and eszopiclone because of the risk of serious injury or death from complex sleep behaviors (U.S. Food and Drug Administration, 2019; Wang et al., 2023).

7.2 Cognitive and Academic Impairment

For a demographic primarily engaged in learning and professional development, the cognitive toll of sleep medication misuse is particularly damaging.

- **The Hangover Effect and Residual Sedation:** Many sleep medications, especially long acting benzodiazepines and first generation OTC antihistamines (like diphenhydramine), have half lives that extend well into the next day. This leads to residual effects commonly known as the "hangover effect." Young people who misuse these drugs often report severe daytime lethargy and unsteadiness, impaired concentration, and a general decline in mental alertness. Studies have shown that this residual impairment may be comparable to impairment observed at legally relevant blood alcohol levels, significantly increasing the risk of accidents while driving to morning lectures or work (Alfarhan, 2024; Algarni et al., 2021).
- **Memory Consolidation Deficits**: Sleep is essential for memory consolidation the process by which short term learning is transformed into long term knowledge. Sedative-hypnotics hinder this process by disrupting the neural oscillations (such as sleep spindles) required for memory transfer. Furthermore, benzodiazepines are known to cause anterograde amnesia, impairing the ability to form new memories while under the drug's influence. For students, this manifests as difficulty retaining information studied during late-night sessions followed by drug use, leading to a direct decline in academic performance and grade point average (Waqas et al., 2015; Hartung et al., 2013).

7.3 Psychological and Neurobiological Consequences

- **The Path to Use Disorder:** The progression from problematic use to a clinical substance use disorder poses a significant risk to young people. Longitudinal studies have shown that the non-medical use of prescription sedatives and analgesics is a strong predictor of the future development of a substance use disorder (Boyd et al., 2018). The neurobiological basis for this phenomenon is linked to the brain's reward system; while benzodiazepines do not directly stimulate dopamine release as intensely as stimulants do, their inhibitory effect on GABAergic interneurons can disinhibit dopamine neurons in the nucleus accumbens, thereby reinforcing patterns of misuse (Blanco et al., 2018).
- **Mental Health Exacerbation**: There is a bidirectional and often destructive relationship between the misuse of sleep medications and mental health. While anxiety and depression frequently drive the onset of misuse, chronic use of these medications can exacerbate mood instability. Long-term use of sedatives is associated with increased emotional blunting, irritability, and paradoxical agitation. In vulnerable young people, withdrawal can lead to severe anxiety and, in some cases, suicidal ideation, further complicating the clinical management of their underlying mental health conditions (Schepis et al., 2018; Rigg & Ford, 2014).

7.4 Social and Economic Fallout

The consequences of substance misuse extend to the social and economic aspects of an individual's life; chronic misuse can strain relationships with family and peers due to emotional instability or secretive behaviors aimed at obtaining drugs. Economically, the cognitive impairments and health complications associated with misuse contribute to a decline in academic productivity, subsequently harming career prospects. Furthermore, the societal cost including emergency room visits and the need for specialized addiction treatment places a significant burden on the healthcare system. (Votaw et al., 2019; McClure et al., 2017).

8. Risk Factors and Vulnerable Populations

The misuse of sleep medications does not occur in isolation; rather, it results from a complex interplay between individual vulnerabilities and environmental stressors. Identifying the specific risk factors that render young people susceptible to this behavior is essential for developing targeted screening tools and prevention programs. Accordingly, this section categorizes these factors into dimensions encompassing individual psychological aspects, social and environmental conditions, and organizational and structural frameworks.

8.1 Individual and Psychological Risk Factors

- **Personality Traits and Behavioral Profiles:** Specific personality traits have consistently been linked to the non-medical use of prescription drugs; "sensation seeking"—defined as the desire for novel and intense experiences—is a key indicator of recreational misuse, particularly among males (Rigg & Ford, 2014). Conversely, individuals scoring high on "neuroticism" (i.e., emotional

instability) tend to engage in the "functional" misuse of medication as a means of coping with internal psychological distress. Furthermore, deficits in impulse control and executive functions render young people more prone to escalating dosages and failing to adhere to medical guidelines (Hartung et al., 2013).

- **Pre existing Mental Health Conditions:** A diagnosis of a mental health disorder is arguably the single strongest risk factor; young people with a history of generalized anxiety disorder, major depression, or post-traumatic stress disorder (PTSD) face a significantly higher likelihood of sedative misuse (Schepis et al., 2018). The "self-medication hypothesis" suggests that these individuals use sleep aids not only to treat insomnia but also to alleviate the physiological arousal associated with their psychological symptoms. Research indicates that young people with co-occurring mental health conditions face a risk of initiating sedative misuse that is two to five times higher than that of their healthy peers (Blanco et al., 2018).
- **History of Polysubstance Use:** The misuse of sleep medications rarely occurs in isolation; a history or concurrent use of alcohol, nicotine, or illicit drugs is a strong predictor of potential future sedative misuse. There is a particularly strong link between the misuse of prescription opioids and the subsequent misuse of sedatives, as users often combine these substances to enhance their effects or to manage withdrawal symptoms associated with one by using the other (Tubbs et al., 2022; McClure et al., 2017).

8.2 Socio Environmental Risk Factors

- **Peer Influence and Social Normalization:** In the social environment of young people particularly within university settings peer behavior is a key factor shaping individual choices. The widespread sharing of pills in student housing fosters an environment where sleep aids are viewed as harmless commodities rather than controlled substances. When young people observe their peers turning to these aids to get through finals week, their threshold for accepting risk lowers. Studies have shown that the perception of peer use of these drugs is a more accurate predictor of potential misuse than the individual's own actual level of sleep disturbances (Lehne et al., 2018).
- **Parental Expectations and Family Dynamics:** Pressures regarding academic and professional achievement often originate within the family; high levels of parental pressure as perceived by children have been linked to increased misuse of both stimulants and sedatives among university students (Hartung et al., 2013). Furthermore, the home medicine cabinet remains a primary source for obtaining these drugs; young people raised in households where prescription medications are readily available and lack strict oversight face a higher risk of initiating misuse (Carrasco-Garrido et al., 2018; Milani et al., 2020).

8.3 Structural and Regulatory Risk Factors

- **Ease of Access and Pharmacy Culture:** In many regions, particularly in the Middle East, the ease of obtaining medications through community pharmacies—either as OTC products or through lax enforcement of prescription laws—is a major structural risk factor. The historical culture of self medication in these regions means that young adults are less likely to view pharmacy acquired drugs as dangerous (Alasmari, 2022; Alfarhan, 2024). In countries without robust Prescription Drug Monitoring Programs (PDMPs), pharmacy shopping remains a viable pathway for individuals to maintain a high volume supply of sedatives (Algarni et al., 2021).
- **Academic and Institutional Pressures:** The structure of higher education itself can be a risk factor. Institutions that foster an all nighter culture through back to back high stakes exams or excessive workloads inadvertently drive students toward pharmacological aids. The lack of accessible, non stigmatized mental health and sleep support services on campus further exacerbates this issue (Waqas et al., 2015).

8.4 Specifically Vulnerable Populations

- **Medical and Healthcare Students:** Students in medicine, pharmacy, and nursing programs constitute a highly vulnerable group; they face immense academic pressure and irregular schedules during clinical rotations, and most importantly possess extensive knowledge of, and greater access to, pharmaceutical drugs. Their familiarity with these medications often fosters a false sense of control, leading them to believe they can safely self-manage the use of sedatives without professional supervision (Alasmari, 2022; Saaed, 2026).
- **Student Athletes:** Student athletes face a dual burden comprising academic requirements and rigorous physical training schedules; the need for rapid recovery, combined with the heightened

states of physical and psychological arousal following evening competitions, often leads to significant sleep disturbances. These athletes may resort to sleep aids to ensure they meet their performance goals, frequently without realizing the impact on their motor coordination and long-term health (Wang et al., 2023).

- **Females and Gender Specific Vulnerabilities:** While males are more inclined toward the recreational misuse of drugs, females often exhibit higher rates of misuse for functional purposes, such as managing anxiety or coping with insomnia (Carrasco-Garrido et al., 2018). This gender disparity is particularly evident in the misuse of "Z drugs" and over-the-counter antihistamines. Furthermore, biological differences in drug metabolism mean that females may experience higher levels of residual sedation at the same dosage, thereby increasing their risk of accidents and adverse effects (Ellis et al., 2024; Milani et al., 2020).

9. The Role of the Pharmacist in Prevention and Early Detection

Community pharmacists occupy a unique and strategic position within the healthcare hierarchy, serving as the final point of contact before medication is dispensed and acting as the most accessible healthcare providers for the general public. Amidst the escalating crisis regarding the misuse of sleep medications among young people, the pharmacist's role must evolve from a traditional function limited to dispensing into one characterized by proactive clinical intervention. As identified in research, the pharmacist is often the only professional capable of bridging the gap between medical prescription and recreational misuse (Algarni et al., 2021).

9.1 Clinical Screening and Identification of Red Flags

Pharmacists are uniquely positioned to detect behavioral and dispensing related indicators that may signal misuse signs that might otherwise go unnoticed by prescribing physicians. Through continuous monitoring of a patient's medication refill history and direct interaction at the dispensing counter, pharmacists can identify numerous warning signs:

- **Refill Patterns:** Frequent requests for early refills or claims of lost medication are classic indicators of dose escalation or diversion (Votaw et al., 2019).
- **Pharmacy Shopping:** In areas implementing comprehensive Prescription Drug Monitoring Programs (PDMPs), pharmacists can identify patients obtaining sedative medications from multiple physicians or pharmacies a behavior often driven by the need to secure large quantities of these drugs (McClure et al., 2017).
- **Specific Requests:** A young adult's insistence on a specific brand name benzodiazepine (e.g., Xanax) or a Z-drug (e.g., Ambien) without a clear clinical justification should prompt a deeper clinical inquiry.
- **OTC Over reliance:** Pharmacists serve as the first line of defense regarding over-the-counter (OTC) sleep aids; therefore, repeated purchases of diphenhydramine or doxylamine by a young adult should signal the need for a consultation regarding their sleep-related health (Alfarhan, 2024).

9.2 Enhancing Health Literacy and Addressing Safety Bias

The belief that pharmacy-dispensed medications are inherently safe is a major factor contributing to medication misuse. Pharmacists have a clinical duty to provide targeted education that dispels this misconception. Effective guidance for young people should include the following:

- **Risk of Tolerance and Dependence:** Clarifying the neurobiological reality that the brain rapidly adapts to modulators affecting the GABA system, leading to a need for higher doses and a risk of severe withdrawal syndrome (Blanco et al., 2018).
- **Synergistic Lethality:** Educating users on the extreme dangers of combining sleep aids with alcohol or opioids. Given that 30% of opioid fatalities involve benzodiazepines, this counseling is literally life saving (Tubbs et al., 2022).
- **The Hangover Effect:** Warning students about residual effects that may impair their academic performance and increase the risk of vehicle accidents the following morning (Algarni et al., 2021).

9.3 Promoting Non Pharmacological Alternatives

Pharmacists can play a role in triaging cases and steering young people away from reliance on medication and toward adopting evidence-based behavioral interventions; when a young person seeks a sleep aid, the pharmacist should take the initiative to conduct a brief intervention to assess sleep habits (sleep hygiene).

- **Sleep Hygiene Counseling:** Providing practical advice on maintaining consistent wake-up times, limiting exposure to blue light, and the concept of "digital sunset" (Scott & Woods, 2018).
- **CBT I Referral:** Pharmacists should be familiar with cognitive behavioral therapy for insomnia (CBT-I) and be able to recommend digital CBT-I (dCBT-I) platforms as a first-line treatment for chronic sleep disorders, thereby reducing the need for pharmacological treatments (Wang et al., 2023).

9.4 Regulatory Advocacy and PDMP Utilization

Pharmacists are the primary users of Prescription Drug Monitoring Programs (PDMPs), and their diligent use of these systems is essential to preventing the diversion of controlled substances into illicit channels. However, their role extends beyond mere software utilization; pharmacists should advocate for the integration of these programs across all healthcare sectors and call for stricter enforcement of regulations governing the dispensing of potent prescription sedatives—particularly in regions where pharmacy culture has historically facilitated easy access to such medications (Alasmari, 2022; Alshahrani et al., 2026).

9.5 Barriers to Effective Pharmacist Intervention

Despite the potential for impact, several systemic barriers hinder the pharmacist's role:

- **Time Constraints:** High prescription volumes in community settings often limit the time available for in depth patient counseling.
- **Lack of Specialized Training:** Many pharmacists report a lack of confidence in addressing substance misuse or providing behavioral sleep advice (Algarni et al., 2021).
- **Patient Resistance:** Young adults may view the pharmacist's inquiry as an intrusion rather than a clinical intervention, especially when the medication is obtained through social sourcing or perceived as a lifestyle tool.

Addressing these obstacles through continuous professional development and the implementation of clinical pharmacy services is a prerequisite for leveraging the pharmacist's unique role in combating the misuse of sleep medications.

10. Prevention and Intervention Strategies

Addressing the multifaceted crisis of sleep medication misuse among young people requires a shift from a reactive, pharmacological approach toward a comprehensive, health-promoting framework. To ensure the effectiveness of prevention and intervention efforts, these initiatives must target the individual, the educational institution, and the regulatory environment; this section outlines evidence-based strategies designed to curb misuse and foster sustainable sleep health.

1. Cognitive Behavioral Therapy for Insomnia (CBT-I)

CBT-I is universally recognized as the gold standard, first line treatment for chronic insomnia, yet it remains significantly underutilized compared to pharmacological options (Riemann et al., 2020). Unlike sedatives, which merely mask symptoms through CNS depression, CBT-I addresses the underlying cognitive and behavioral factors that maintain sleep disturbances.

Core Components of CBT-I:

- **Stimulus Control:** Re establishing the psychological association between the bed and sleep by restricting non sleep activities (like studying or scrolling) in the bedroom.
- **Sleep Restriction Therapy:** Limiting time in bed to match actual sleep duration, thereby increasing the homeostatic sleep drive (Process S).
- **Cognitive Restructuring:** Identifying and challenging catastrophic thoughts regarding the consequences of a poor night's sleep, which often drive the desperation for medication.
- **Relaxation Training:** Techniques such as progressive muscle relaxation or mindfulness to reduce the physiological hyper arousal common in anxious young adults.

Digital CBT-I (dCBT-I): An Accessible Solution:

For the tech savvy young adult demographic, digital CBT-I (dCBT-I) platforms and mobile applications offer a scalable, low stigma, and cost effective intervention. Internet based cognitive behavioral therapy for insomnia (dCBT-I) has been shown by research to be as effective as face to face therapy, as it improves sleep onset time and reduces reliance on sleep medications (Wang et al., 2023).

Integrating dCBT-I into university health services could significantly reduce the initiation of misuse among students.

2. Institutional Interventions: Reforming University Culture

Educational institutions play a pivotal role in either exacerbating or curbing the misuse of sleep medications; therefore, a transformation of the academic system is needed to put an end to the normalization of sleep deprivation.

- **Sleep Hygiene Education:** Universities should integrate sleep health into their mandatory wellness curriculum. This includes educating students on the biological necessity of sleep, the dangers of blue light, and the Uppers and Downers cycle (Scott & Woods, 2018; Waqas et al., 2015).
- **Academic Policy Reform:** Structural changes, such as avoiding the scheduling of multiple high stakes exams on consecutive days and eliminating all nighter study facilities, can reduce the acute academic stress that drives students toward pharmacological aids.
- **Accessible Mental Health Support:** Providing non stigmatized, rapid access counseling for anxiety and depression can address the primary drivers of self medication misuse (Hartung et al., 2013).

3. Regulatory and Policy Interventions

Governments and health authorities must strengthen the regulatory framework surrounding sedative hypnotics to prevent diversion and misuse.

- **Stricter Enforcement of Prescription Laws:** In regions where pharmacy culture allows for easier access, regulatory bodies must ensure that BZDs and Z drugs are strictly dispensed only upon a valid, verified prescription (Alasmari, 2022).
- **PDMP Integration:** Expanding and mandating the use of Prescription Drug Monitoring Programs (PDMPs) across all pharmacies and clinics is essential for identifying pharmacy shopping and social sourcing patterns (McClure et al., 2017).
- **Re evaluating OTC Status:** There is a growing call for health authorities to re evaluate the OTC status of certain high potency, first generation antihistamines (like diphenhydramine) or to implement behind the counter status, requiring a pharmacist consultation prior to purchase (Algarni et al., 2021; Alfarhan, 2024).

4. Public Health Awareness Campaigns

Targeted awareness campaigns must address the specific motivations and safety biases of the 18-35 age group.

- **De normalizing Misuse:** Campaigns should focus on the reality that sleep medication misuse is not a harmless study aid but a risk factor for addiction and lethal overdose.
- **Highlighting Polysubstance Risks:** Specific emphasis must be placed on the dangers of combining sedatives with alcohol, a message that is particularly critical for the social environments of young adults (Tubbs et al., 2022).
- **Promoting Sleep Positive Identities:** Utilizing social media influencers and student leaders to reframe sleep as a component of peak performance and mental resilience, rather than a sign of weakness.

5. Pharmacist Led Risk Reduction Programs

As the most accessible healthcare providers, pharmacists should be empowered to lead risk-reduction interventions. This includes implementing "brief interventions" at points of dispensing, where pharmacists can identify instances of misuse and provide immediate counseling on non pharmacological alternatives (Algarni et al., 2021). Equipping pharmacists with specialized training in sleep health and counseling on substance misuse is a prerequisite for the success of these programs.

11. Discussion

The body of evidence presented in this review highlights a significant and growing public health concern: the misuse of sleep medications among young people. This phenomenon is not merely a clinical issue concerning drug misuse; rather, it is deeply rooted in the neurobiological, sociocultural, and structural fabric of contemporary life. An analysis of the findings across various dimensions reveals several key themes that warrant in-depth, critical discussion.

One of the most notable findings of this review is the prevalence of the functional misuse of sedatives that is, using them not for recreational euphoria, but as a tool for academic and professional survival. As previously mentioned, the cycle of stimulants and sedatives common among university students points to a significant shortcoming in the current academic system. Students effectively use these drugs to push beyond their biological limits a behavior considered normal, and even encouraged, in a culture that equates sleep deprivation with dedication (Waqas et al., 2015; Saaed, 2026).

This paradox lies in the fact that, despite being used to ensure optimal performance the following day, these medications fundamentally impair the very cognitive processes such as memory consolidation and executive functions that are essential for success (Walker & Stickgold, 2006). The immediate relief they provide at the onset of sleep comes at the cost of long-term neurocognitive decline and an increased risk of dependency; this highlights a significant gap in awareness among young people, who may understand the drugs' mechanisms of action but overlook their long-term physiological and psychological consequences.

The notable increase in cases of misuse among students in the Middle East and North Africa particularly in Saudi Arabia and Egypt indicates that the factors driving such misuse are significantly influenced by local organizational and cultural contexts (Alasmari, 2022; Alshahrani et al., 2026).

In these regions, the established culture of pharmacy uses and the relative ease of obtaining medicines through community pharmacies create a unique risk profile. Unlike in North America where social networks (friends and family) serve as the primary source for obtaining drugs community pharmacies in the Middle East and North Africa often act as a principal, albeit unregulated, source for medications that individuals use on their own initiative, without medical consultation. This reality underscores the urgent need for localized, culturally tailored interventions that account for the specific social and legal contexts of these regions, rather than relying exclusively on Western-style prevention models.

Furthermore, the widespread misuse of over-the-counter sleep aids among young people (Alfarhan, 2024) is a direct consequence of this systemic shortcoming; when young people view these products as safe and use them without professional supervision, they face significant risks, including prolonged sedative effects (residual drowsiness) and anticholinergic toxicity. Therefore, restoring the pharmacist's role as a provider of clinical interventions and an educator on sleep health is not merely a recommendation but a prerequisite for any successful response to this crisis.

On the other hand, the role of digital technology discussed in Section 6 represents a new and challenging area regarding sleep health. Phenomena such as "revenge bedtime procrastination" and the addictive nature of social media are not merely lifestyle choices; they are potent drivers of insomnia, which in turn leads to medication misuse (Scott & Woods, 2018). As digital connectivity becomes increasingly widespread, the pressures on natural sleep patterns will only intensify.

However, technology also offers a potential solution through digital cognitive behavioral therapy for insomnia (dCBT-I). The success of these platforms (Wang et al., 2023) suggests that the very digital tools causing sleep disturbances can also be leveraged to restore sleep; the challenge facing public health authorities and university officials lies in integrating these digital interventions into the daily lives of young people before they turn to quick-fix pharmacological solutions.

12. Limitations of the Review

Several limitations should be considered when interpreting this review. First, it is a narrative review; although a structured search and explicit eligibility criteria were used, no formal risk-of-bias assessment was performed and no meta-analysis was possible, so selection and interpretation bias cannot be excluded. Second, definitions of misuse, drug classes, recall periods, and age ranges differed markedly across studies, which limits direct comparison of prevalence estimates and may partly explain the wide ranges reported (for example, between general-population surveys and surveys of medical students).

Third, most of the evidence is derived from cross-sectional, self-reported surveys, which are subject to recall and social-desirability bias and cannot establish causality. Fourth, the evidence base is geographically uneven: most data originate from North America and Europe, and data from North Africa, including Libya, are scarce. Fifth, restricting the search to three databases and to English-language publications, and including a non-peer-reviewed preprint, may have introduced publication

and language bias. Finally, statements about the role of pharmacists are largely extrapolated from studies on other drug classes, as controlled evaluations of pharmacist-led interventions for sleep medication misuse are lacking.

13. Future Directions

The findings of this review highlight several critical areas where current scientific understanding is insufficient. To effectively combat the escalating crisis of sleep medication misuse among young adults, future research must move beyond simple prevalence surveys and adopt more sophisticated, longitudinal, and interdisciplinary approaches. The following areas represent the most urgent priorities for the next decade of sleep science and public health research.

1. **Longitudinal Impact on Neurodevelopment and Aging:** While the acute consequences of sedative misuse are well documented, the long term impact on the developing brain remains a significant black box. Young adulthood is a critical period for the structural refinement of the prefrontal cortex and the consolidation of neural networks. Future research should utilize longitudinal cohort studies and neuroimaging (fMRI/PET) to track individuals who misuse sleep medications over several decades.
   Specifically, we need to understand if early life disruption of the GABAergic system and the suppression of REM sleep through medication misuse predispose individuals to premature cognitive decline or neurodegenerative diseases, such as Alzheimer's, in later life. The role of the Glymphatic System—and how its pharmacological disruption affects long term proteopathic accumulation—should be a primary focus of neurobiological research (Nedergaard & Goldman, 2020; Xie et al., 2013).
2. **Expanding the Geographic and Cultural Map:** The geographic bias identified in this review must be corrected. There is an urgent need for large scale, nationwide epidemiological studies in the Middle East, North Africa, and Asia. These studies should not merely replicate Western methodologies but should be designed to capture local nuances, such as the influence of pharmacy culture, the impact of religious and social stigmas on psychiatric help seeking, and the specific regulatory loopholes that facilitate misuse (Alasmari, 2022; Alshahrani et al., 2026).
   Furthermore, comparative cross cultural research could provide valuable insights into how different educational systems and labor market pressures influence the Hustle Culture that drives functional misuse. Understanding these cultural drivers is essential for developing prevention programs that resonate with young adults in diverse global contexts.
3. **Evaluating Pharmacist Led Interventions:** Despite the theoretical potential of the pharmacist, there is a lack of empirical evidence evaluating specific pharmacist led intervention protocols for sleep medication misuse. Future research should focus on randomized controlled trials (RCTs) that test the efficacy of:
   - **Brief Interventions (BI) at the Pharmacy Counter:** Assessing whether a 5 minute screening and counseling session can reduce the frequency of OTC misuse or prompt a referral for professional sleep therapy (Algarni et al., 2021).
   - **Pharmacist Physician Collaborative Models:** Evaluating how integrated communication between prescribers and dispensers, facilitated by PDMPs, can prevent pharmacy shopping and social sourcing.
   - **Educational Outreach:** Testing the impact of pharmacist led workshops in university settings on students' health literacy and perceived safety of sleep aids.
4. **The Efficacy and Integration of Digital Therapeutics (dCBT-I):** As digital CBT-I (dCBT-I) emerges as a viable alternative to pharmacology, future research must examine its long term efficacy and real world integration. We need to understand the factors that influence adherence and engagement with digital platforms among young adults, who are often prone to digital fatigue. Research should also explore the potential for hybrid models of care, where digital tools are combined with brief professional guidance from pharmacists or university counselors. Evaluating the cost effectiveness of these digital interventions compared to the long term costs of medication related morbidity will be crucial for convincing policymakers to fund these programs (Wang et al., 2023).
5. **Policy Research and Regulatory Impact:** There is a need for rigorous policy research to evaluate the impact of different regulatory frameworks on misuse patterns. For instance, studies should compare regions with mandatory PDMP utilization against those with voluntary systems. Research should also examine the impact of re classifying high potency OTC antihistamines as behind the

counter or prescription only drugs. Understanding which regulatory levers are most effective at reducing supply without hindering access for those with legitimate clinical needs is essential for evidence based policymaking (McClure et al., 2017; Alfarhan, 2024).

14. Conclusion

The misuse of sleep medications among young adults represents a significant, multifaceted, and growing public health concern that warrants early and coordinated action. This review has synthesized global and regional evidence to demonstrate that the problem is not merely a consequence of individual choices, but is driven by a complex interplay of neurobiological vulnerabilities, socio cultural pressures, and systemic failures in healthcare delivery. From a neurobiological perspective, we have highlighted the critical importance of sleep for the maturation of the prefrontal cortex and the functioning of the Glymphatic waste clearance system. The chronic disruption of these processes through pharmacological misuse may pose long term risks to neurocognitive health, although this remains to be confirmed by longitudinal research. The functional misuse prevalent in academic settings, driven by a pervasive hustle culture, underscores a profound societal devaluation of rest that must be addressed at the institutional level. Epidemiologically, while most of the available evidence comes from North America, emerging data from the Middle East and North Africa reveals a burgeoning problem influenced by unique cultural attitudes and regulatory gaps. The high prevalence of self medication and over the counter (OTC) misuse in these regions highlights the necessity of localized, culturally tailored prevention strategies. The available evidence suggests that the community pharmacist is well placed, though currently underutilized, in efforts against misuse; however, controlled evaluations of pharmacist-led interventions are still needed. By evolving from a traditional dispensing role to a proactive clinical interventionist, the pharmacist may serve as an important gatekeeper, identifying red flags, addressing health literacy gaps, and promoting evidence based alternatives like CBT I. In conclusion, addressing the sleep medication crisis requires a paradigm shift. We must move away from the normalization of sleep deprivation and the reliance on pharmacological quick fixes toward a culture that prioritizes sustainable sleep health. This requires the integration of non pharmacological therapies like digital CBT I into university health services, the strengthening of regulatory frameworks and PDMP utilization, and the empowerment of healthcare providers, particularly pharmacists, to lead the charge in prevention and early detection. The long term health, productivity, and well being of the young adult population depend on our ability to restore the biological and social sanctity of sleep.

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