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Sleep Insufficiency among Adolescents in Africa: A Narrative Review

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Abstract

Background: Sleep insufficiency (SI) among adolescents is a global public health concern, but its prevalence and impact on African adolescents remain poorly understood. Extensive research has been conducted on SI in developed countries, but there is a lack of knowledge about its occurrence and consequences in Africa. Objective: This study aims to thoroughly review existing literature on sleep insufficiency among African adolescents to determine the extent of SI, its health implications, and its economic burden. Methods: A systematic search was performed in PubMed, EBSCOhost, Web of Science, Scopus, and Sabinet (African Journals) from the inception of these databases until February 14, 2023. The search terms used included "insufficient sleep," "sleep loss," "sleep disorders," "adolescents," "youth" aged 12-17 years, and "Africa." Only five of the 15 eligible full-text studies identified met the inclusion criteria and were included in this review. Results: The available studies on SI among African adolescents were limited, but all the included studies reported a high prevalence of SI in this population. Factors associated with SI in Africa included nighttime use of electronic gadgets, co-sleeping with siblings, and nightmares. No intervention or treatment studies for SI among African adolescents were found, and none of the studies explored the health consequences or estimated the economic burden of this condition.

Conclusion: There needs to be more research on sleep insufficiency among African adolescents, with limited information regarding its prevalence, health implications, and economic burden. Further studies are necessary to address this knowledge gap, which can contribute to policymaking and developing accessible and cost-effective interventions to manage sleep insufficiency in this population.

Keywords: *Sleep insufficiency, Adolescents' Health, Africa, Narrative Review.*
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Introduction

Sleep sufficiency is a prerequisite for proper physical and mental functioning and enhanced longevity Centre for Disease Control and Prevention (CDC) (2020). Sleep is an essential requirement for adolescent health and development. Thus, untreated sleep problems would negatively influence basic behavioural patterns that affect general family health and interpersonal relationships. Adequate sleep helps build innate body immunity, enhance sugar metabolism to prevent diabetes, improve school performance, and work effectively and safely (Centre for Disease Control and Prevention (CDC), 2020).

SI in adolescents refers to a condition where adolescents do not obtain an adequate amount of sleep required for their age group. It is characterized by a consistent lack of sleep duration and/or poor sleep quality, leading to an insufficient amount of restorative sleep. Adolescents typically require around 8-10 hours of sleep per night for optimal health and

functioning (Centre for Disease Control and Prevention (CDC), 2020). However, SI often occurs due to various factors such as excessive academic workload, social demands, electronic device use, irregular sleep schedules, and environmental factors. It can have negative effects on adolescents' physical health, cognitive abilities, emotional well-being, and overall quality of life (Kochanek et al., 2014).

Grandner et al. (2010) stated that, SI is a typical challenge in today's modern age and can affects people of all ages worldwide with a significant public health issue that has been dramatically underappreciated especially in Africa. According to the International Classification of Sleep Disorders (ICSD-3), sleep is a curtailed sleep pattern that has lasted for at least three months for most days of the week, along with complaints of sleepiness during the day. Furthermore, Van Cauter and Knutson (2008) explained that sleep timing and duration affect several hormones and other neuro-metabolic functions needed to maintain an individual's health. Thus, SI is associated with an increased risk of heart diseases, hypertension, obesity, diabetes, and a high mortality rate.

According to the accelerated global action for adolescents' health, adolescents are one-sixth of the world's population, accounting for 6% of the world's global burden of disease and injury (WHO, 2018). In addition, the WHO guideline stated that 50% of all mental health disorders in adulthood start by age 14, and most of the cases go undetected and untreated. The WHO (2018) facts sheet also stated that adolescence is the period when many risky behaviours start having a significant impact on their health as adults, and their health needs particular attention in any health setting.

Previous research has shown that electronic gadgets such as phones, video games are integrated into adolescents' lives**,** and their value cannot be overemphasised (Cajochen et al., 2011; Chellappa et al., 2013; Van der Lely et al., 2015). Several pathways have been hypothesised to explain how technological gadgets affect sleep. One mechanism highlighted by some authors is that light, incredibly short-wavelength light emitted from screens, may alter circadian processes such as melatonin release, making falling to sleep difficult (Cajochen et al., 2011; Watson et al., 2015).

Another mechanism hypothesised by other researchers opined that cognitive and physiologic arousal from electronic gadgets makes it difficult for the body to "go off" (Arora et al., 2014; Kochanek et al., 2014; Weaver et al., 2010). In addition, electronic gadget use during the evening/night in children and adolescents has been associated with delayed bedtime and reduced total sleep time (Owens, 2014; Watson et al., 2015).

Several studies have shown how lack of sleep can lead to premature death. For example, a systematic review concluded that individuals who sleep for less than 6 hours per night have ten times the risk of early death than their counterparts who sleep 7-9 hours every night (Hafner et al., 2017). Furthermore, observed that insufficient sleep is a global problem and increasingly becoming worrisome and shared in today's society. These authors stated that sleep insufficiency could lead to several health implications: cognitive issues, mood and judgment problems, depression and anxiety, cardiovascular morbidity and mortality, low academic achievements, and poor general health and well-being. Unfortunately, all the articles reviewed in this study did not show any health implication of sleep insufficiency among adolescents in Africa. Therefore, this narrative review aims to provide information on sleep insufficiency among adolescents in Africa to understand its extent, the health implication(s) and the economic burden which may be used to reduce the rising prevalence of the problem and prevent the risk of unproductive adults.

2. Methodology:

Ferrari (2015) describes a narrative review process used in the current study. The narrative review was conducted by searching electronic databases of PubMed, CINHAL,

Web of Science, and Sabinet (African Journals) from inception to February 14 2023. Studies conducted in Africa and provided information on prevalence, epidemiology, treatments, assessments, health or economic burden of insufficient sleep, sleep deprivation, sleep insufficiency or sleep loss in adolescents' population using all types of research designs were included in this review. In addition, literature that focused on people outside Africa, adults, insomnia, sleep problems related to medical conditions such as cerebral palsy, autism, alcoholism, and other sleep disorders were excluded in this study.

The following search terms: epidemiology, prevalence, economic cost, sleep cost, cost estimation, economic burden, health implications, health consequences, Insufficient sleep, sleep insufficiency, sleep loss, sleep disturbances, sleep deprivation, adolescents, teenagers, teens, youths, and Africa were used.

The entire search yielded 1148 documents for review after removing duplicates. Authors (B.B. and U.U.) inspected each category's titles, selecting 12 articles that met the inclusion criteria. Each investigator carefully read the 12 full-text sources, collectively identifying five studies that provided relevant information on the epidemiology of sleep insufficiency among adolescents in Africa. Both researchers read all the articles in the full text before being included in this study. The summary of resources identified from each database are as follows: PUBMED = 212, EBSCOhost = 186, Scopus = 161, Web of science = 47 and Sabinet (African Journals) = 822. See Figure 1 for the flowchart study identification and screening process.

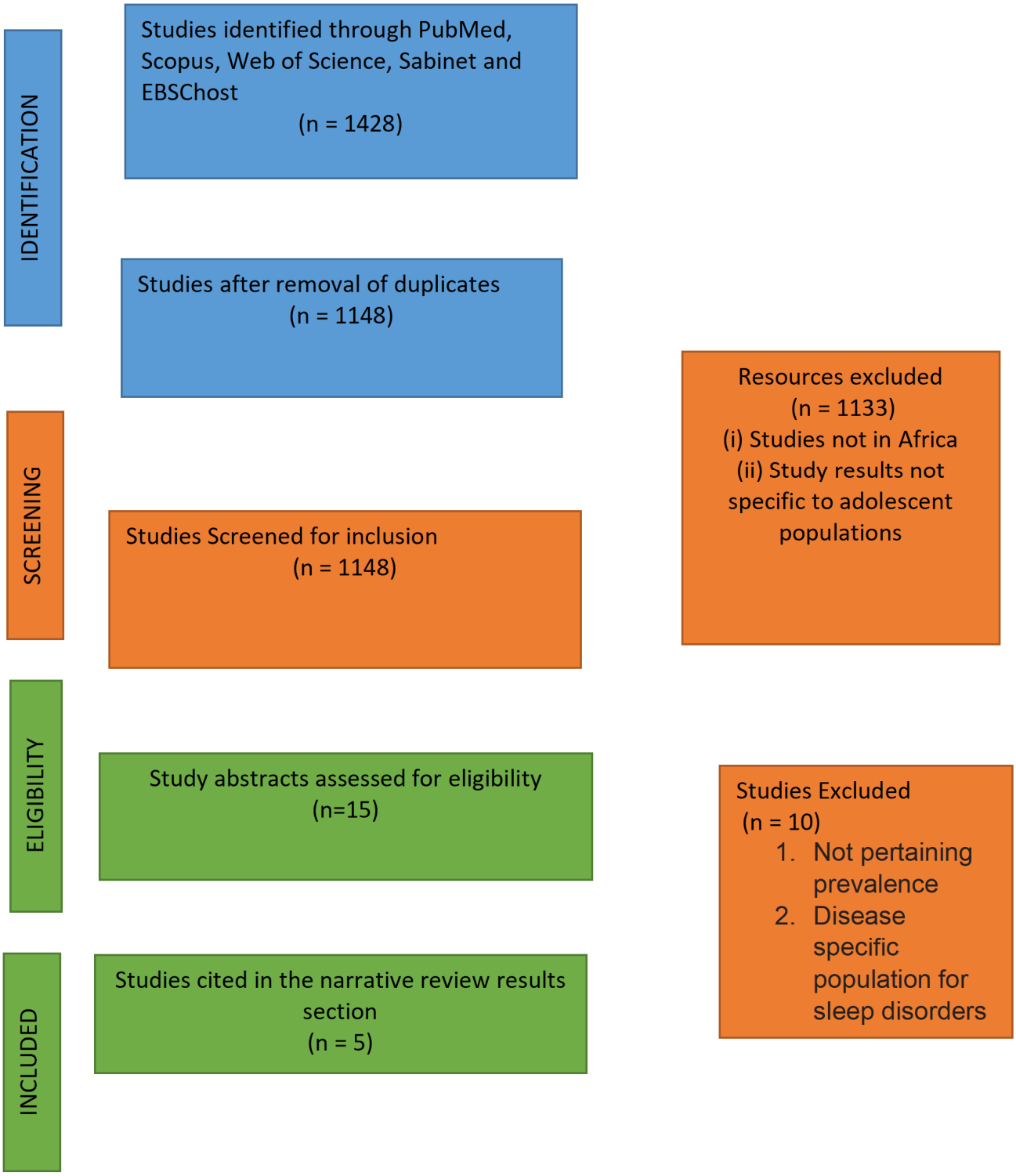

Figure 1: *Flowchart of Study Identification and Screening Process*

Results

Only five articles met the inclusion criteria and were included in this study. The few publications show a dearth of literature on adolescent SI in Africa regarding the extent, health consequences, and economic burden of the condition among this vulnerable population. Table 1 summarises the

characteristics of the included studies. Most of the included studies focused on; (1) prevalence (Balogun et al., 2017; Maduabuchi et al., 2014; Olorunmoteni et al., 2018; Reid et al., 2002; Sanya et al., 2015) (2) Socio-environmental factors and use of a mobile device (Olorunmoteni et al., 2018; Sanya et al., 2015) and (3) sleep behaviour (Maduabuchi et al., 2014; Reid et al., 2002). None of the reviewed studies assessed the health consequences or economic burden of sleep insufficiency among adolescents in Africa.

The current review showed that most studies on sleep insufficiency mainly emanated from Nigeria (Balogun et al., 2017; Maduabuchi et al., 2014; Olorunmoteni et al., 2018; Sanya et al., 2015) except one from South Africa (Reid et al., 2002). There were variabilities in the outcome measured used; Two (2) studies (Reid et al., 2002; Sanya et al., 2015) designed their tools from previous studies but failed to mention any standardisation process used to ensure validity and reliability. The present study also demonstrated no standard agreement on the definition of good or sufficient sleep hours for African adolescents. Two studies used the same time of 8.5 hours sleep/night as adequate (Balogun et al., 2017; Olorunmoteni et al., 2018), while others used 10 hours. None of the studies focused on intervention or prevention strategies for sleep insufficiency among the teenagers.

Prevalence of Insufficient Sleep

The majority of the articles in this study showed that adolescents' sleep insufficiency in Africa is high. This high prevalence conforms with previous studies in developed nations, as Wheaton et al. (2016) reported. The authors mentioned that the prevalence rate of sleep insufficiency worldwide ranged from 62 - 72%, with most adolescent students reporting less than 8 hours of sleep on most nights. However, Maduabuchi et al. (2014) study in Nigeria revealed the lowest prevalence rate of 22.8%. Still, it used 9.5 hours as the minimum night sleep hours required for adolescents to get enough sleep. It may be why the prevalence rate in this study tends to be the lowest of all the studies. The differences in the reported prevalences could have been due to differences in the outcome measures used, the sample size and sampling techniques, and other methodological issues. Nevertheless, such prevalence among this vulnerable population is still considered high. It may cover many adolescents who would be left to suffer if there are no urgent interventions and preventive measures.

Chattu et al. (2018) reported that the leading cause of insufficient sleep is chronic sleep deprivation, which leads to excessive daytime sleepiness. These authors further stressed that the prevalence of excessive sleepiness had ranged widely from studies worldwide, including Australia, the USA, Saudi Arabia, Japan, Asia, New Zealand, and South Korea, from 2.5% to 26%. There is also a pressing need to address teenage sleep deprivation in Africa.

Socio-environmental Factors and Use of an Electronic Device

Two studies (Olorunmoteni et al., 2018; Sanya et al., 2015) in this current review showed that electronic and mobile phone devices are factors that predispose adolescents in Africa to insufficient and quality night sleep. In the study of Olorunmoteni et al. (2018), 81% of adolescents use one form of an electronic device or the other at night. However, Sanya et al. (2015) reported only 15.3% of adolescents to have access to an electronic device at night. The findings of Sanya et al. (2015) could have been due to how the question was framed; do you use electronic devices late into the night? The question could conceive different meanings to different respondents; maybe it means at midnight or some night. Recent studies have demonstrated that excessive electronic devices at bedtime significantly affect adolescents' sleep duration and have severe health implications (Foerster et al., 2019; Mei et al., 2018). Owens and Pediatrics (2014) reported that many studies have shown that exposure to electronic devices in the evening disrupts

night sleep. Multiple devices are associated with less sleep at night and more significant excessive daytime sleepiness (Carter et al., 2016). Therefore, it is essential for researchers in this field to explore more on electronic gadgets and sleep insufficiency as these gadgets have been fast increasing among adolescents in Africa (Porter et al., 2016).

Socio-environmental factors assessed to be associated with insufficient sleep include female sex, early adolescence and those from polygamous families (Olorunmoteni et al., 2018). Another aspect highlighted in Sanya et al.'s (2015) study was that adolescents who sleep together in one room have more odds of having sleep insufficiency than those who sleep alone. However, parents' socioeconomic status does not seem to affect adolescents' sleep, as reported in the study of Balogun et al. (2017).

Sleep Behaviors

All of the reviewed articles assessed sleep behaviour among the participants. Our review showed that sleep insufficiency was more common for all participants during the weekdays than the weekends. This is because the school start time is usually 7:30 am in Nigeria, and there is no school at the weekend. The current study demonstrated some unusual sleep behaviours participants exhibited, including sleepwalking, talking, bruxism, and restless leg syndrome. Other factors reported by some respondents associated with sleep insufficiency are; need to use the bathroom, not breathing correctly, coughing/or snoring loudly, and having nightmares or pain. Balogun et al. (2017) stated that physical exercises duration and caffeinated drinking beverages are also associated with adolescents' sleeping behaviour in Africa.

Table 1: Summary of the included studies

SN	Authors (year)	Design	Mean age of participants	Country	Sample size	Outcome measures	Prevalence	Adequate sleep hours/night	Use of an electronic device	Recommendation
1.	Balogun et al. (2017)	Cross-section survey	13	Nigeria	450	Pittsburgh Sleep Quality Index (PSQI) questionnaire	50%	8.50	NIL	Inadequate sleep is common in adolescent school children in Nigeria. This issue can be especially problematic for those with short sleep duration.
2.	Olorunmotemi et al. (2018)	Cross-section survey	13.5±2.29	Nigeria	346	Adolescent Sleep Habits Survey Questionnaire	44.4%	8.50	81%	More sleep-related research is urgently needed within Nigeria's growing adolescent health program setting.
3.	Maduabuchi et al. (2014)	Cross-section survey	15.79	Nigeria	443	Epworth Daytime Sleepiness Scale and the Pittsburgh Sleep Quality Index (PSQI)	22.8%	9.15	NIL	Adolescents have varying degrees of sleeping practice and hygiene; there is a need for more research to ascertain the extent of the problem.
4	Reid et al. (2002)	Cross-section survey	16.10	South Africa	823	Verbal questions; no standard questionnaire	61.5 %	8.25	NIL	Like in other countries, South African adolescents get too little sleep during the week. They try to compensate for it by sleeping on the weekends.
5.	Sanya et al. (2015)	Cross-sectional survey	15.30	Nigeria	1033	Self-designed; No standardization	59%	9.0	15.3%	A substantial number of students had insufficient night sleep. There is a need to educate schooling teenagers on the dangers of prolonged sleep insufficiency.

Discussion

Sleep insufficiency among adolescents had been well documented among developed nations with adequate intervention adopted to reduce the consequences on adolescents' health and ensure better adulthood. In Africa, less attention is placed on adolescents' SI, probably due to the higher incidence of infectious diseases and higher budgetary allocation to combat such diseases. This neglect of SI may likely produce youths and adults with many mental illnesses and more chronic noncommunicable diseases in Africa. Since almost two decades ago, Reid et al. (2002) surveyed a large group of South African adolescents about their sleep behaviour, daytime behaviours, and morning alertness compared to other teenagers worldwide. The authors found out that South African adolescents get insufficient sleep, influencing their academic performance just like teenagers worldwide. Two studies from Nigeria, which were regional-based with a small sample size of fewer than 500 adolescents, found that remarkable low sleep quality exists among Nigerian adolescents. Unfortunately, no intervention or national policy to combat the burden of sleep insufficiency is available in Africa. A study by Aragon-Arreola et al. (2016) affirmed that the impact of sleep on health and wellness generally among Africans is still yet under-researched as there is not enough data that will inform policymaking. The authors extrapolated the data of African Americans. They concluded that further research is needed in sub-Saharan Africa to reduce and prevent the problem of SI and its impact on the well-being of teenagers. In addition, none of the included studies in this review demonstrated the economic cost of SI among adolescents in Africa. Thus, no data could be used to argue that policies should be prioritised when addressing public health issues like SI.

Brunello et al. (2000) reported that SI presents a substantial economic burden to society. For example, the authors stated that in the United States of America, since 1990, the cost of insomnia has been placed at USD 10.9 billion devoted to the cost of drugs used to promote sleep, while USD 9.8 billion is budgeted for nursing home care for the elderly with sleep disorders. Furthermore, a recent study by Hafner et al. (2017) suggests that insufficient sleep could also have grave economic consequences for countries. For example, the authors mentioned that the estimated overall cost of SI in Australia in 2016-2017 was $45.21 billion. This is a massive sum compared to the total budget of Africa's biggest economy (Nigeria). Yet little attention is given to this serious public health issue in Africa especially among vulnerable population of adolescents.

It is believed that if policymakers in Africa pay more attention to enhancing adolescents' mental health by improving their sleep quantity and quality, the burden of SI would be significantly reduced.

Conclusion

There is a dearth of studies on adolescents' sleep insufficiency in Africa, with little or no information on the extent of insufficient sleep, health implications, and economic burden on the system.

Recommendation

It was recommended that a concerted effort among all stakeholders, including policymakers, researchers, government at all levels, private sector and individuals, to pay more attention to sleep insufficiency among adolescents and provide preventable measures to reduce the consequences of the problem.

Conflict of Interest: Authors declare no conflict of interest

References:

Aragon-Arreola, J. F., Moreno-Villegas, C. A., Armienta-Rojas, D. A., & De la Herran-Arita, A. K. (2016). An insight of sleep disorders in Africa. *eNeurologicalSci*, *3*, 37-40. https://doi.org/10.1016/j.ensci.2016.02.006

Arora, T., Broglia, E., Thomas, G. N., & Taheri, S. J. S. m. (2014). Associations between specific technologies and adolescent sleep quantity, sleep quality, and parasomnias. *15*(2), 240-247.

Balogun, F. M., Alohan, A. O., & Orimadegun, A. E. (2017). Self-reported sleep pattern, quality, and problems among schooling adolescents in southwestern Nigeria. *Sleep Med*, *30*, 245-250. https://doi.org/10.1016/j.sleep.2016.11.013

Brunello, N., Armitage, R., Feinberg, I., Holsboer-Trachsler, E., Léger, D., Linkowski, P., Mendelson, W. B., Racagni, G., Saletu, B., & Sharpley, A. L. J. N. (2000). Depression and sleep disorders: clinical relevance, economic burden and pharmacological treatment. *42*(3), 107-119.

Cajochen, C., Frey, S., Anders, D., Späti, J., Bues, M., Pross, A., Mager, R., Wirz-Justice, A., & Stefani, O. J. J. o. a. p. (2011). Evening exposure to a light-emitting diodes (LED)-backlit computer screen affects circadian physiology and cognitive performance. *110*(5), 1432-1438.

Carter, B., Rees, P., Hale, L., Bhattacharjee, D., & Paradkar, M. S. (2016). Association Between Portable Screen-Based Media Device Access or Use and Sleep Outcomes: A Systematic Review and Meta-analysis. *JAMA Pediatr*, *170*(12), 1202-1208. https://doi.org/10.1001/jamapediatrics.2016.2341

Centre for Disease Control and Prevention (CDC). (2020, 15/04/2020). *Sleep and Sleep Disorders*. Retrieved 31/08/2021 from https://www.cdc.gov/sleep/index.html

Chattu, V. K., Sakhamuri, S. M., Kumar, R., Spence, D. W., BaHammam, A. S., & Pandi-Perumal, S. R. J. S. S. (2018). Insufficient Sleep Syndrome: Is it time to classify it as a major noncommunicable disease? , *11*(2), 56.

Chellappa, S. L., Steiner, R., Oelhafen, P., Lang, D., Götz, T., Krebs, J., & Cajochen, C. J. J. o. s. r. (2013). Acute exposure to evening blue-enriched light impacts on human sleep. *22*(5), 573-580.

Ferrari, R. (2015). Writing narrative style literature reviews. *Journal of Public Health*, *24*(4), 230-235.

Foerster, M., Henneke, A., Chetty-Mhlanga, S., & Röösli, M. (2019). Impact of Adolescents' Screen Time and Nocturnal Mobile Phone-Related Awakenings on Sleep and General Health Symptoms: A Prospective Cohort Study. *International journal of environmental research and public health*, *16*(3), 518. https://doi.org/10.3390/ijerph16030518

Grandner, M. A., Hale, L., Moore, M., & Patel, N. P. (2010). Mortality associated with short sleep duration: The evidence, the possible mechanisms, and the future. *Sleep Med Rev*, *14*(3), 191-203. https://doi.org/10.1016/j.smrv.2009.07.006

Hafner, M., Stepanek, M., & Troxel, W. M. J. S. H. (2017). The economic implications of later school start times in the United States. *3*(6), 451-457.

Kochanek, K. D., Murphy, S. L., Xu, J., & Arias, E. (2014). Mortality in the United States, 2013. *NCHS Data Brief*(178), 1-8.

Maduabuchi, J. C., Obu, H. A., Chukwu, B. F., Aronu, A. E., Manyike, P. C., & Chinawa, A. T. J. T. P. A. m. j. (2014). Sleep pattern and practice among adolescents school children in Nigerian secondary schools. *19*.

Mei, X., Zhou, Q., Li, X., Jing, P., Wang, X., Hu, Z., & Practice. (2018). Sleep problems in excessive technology use among adolescent: A systemic review and meta-analysis. *Sleep Science*, *2*(1), 9.

Olorunmoteni, O. E., Fatusi, A. O., Komolafe, M. A., & Omisore, A. (2018). Sleep pattern, socioenvironmental factors, and use of electronic devices among Nigerian school-attending adolescents. *Sleep Health*, *4*(6), 551-557.

Owens, J. (2014). Insufficient sleep in adolescents and young adults: an update on causes and consequences. *Journal of Paediatrics*, *134*(3), e921-e932.

Owens, J., & Pediatrics, A. S. W. G. J. (2014). Insufficient sleep in adolescents and young adults: an update on causes and consequences. *134*(3), e921-e932.

Porter, G., Hampshire, K., Milner, J., Munthali, A., Robson, E., De Lannoy, A., Bango, A., Gunguluza, N., Mashiri, M., & Tanle, A. (2016). Mobile Phones and education in Sub-Saharan Africa: from youth practice to public policy. *Journal of International Developmen*, *28*(1), 22-39.

Reid, A., Maldonado, C. C., & Baker, F. C. J. S. (2002). Sleep behavior of South African adolescents. *25*(4), 417-421.

Sanya, E., Kolo, P., Desalu, O., Bolarinwa, O., Ajiboye, P., & Tunde-Ayinmode, M. (2015). Self-reported sleep parameters among secondary school teenagers in middle-belt Nigeria. *Nigerian Journal of Clinical Practice*, *18*(3), 337-341.

Van Cauter, E., & Knutson, K. L. J. E. j. o. e. (2008). Sleep and the epidemic of obesity in children and adults. *159*(suppl_1), S59-S66.

Van der Lely, S., Frey, S., Garbazza, C., Wirz-Justice, A., Jenni, O. G., Steiner, R., Wolf, S., Cajochen, C., Bromundt, V., & Schmidt, C. (2015). Blue blocker glasses as a countermeasure for alerting effects of evening light-emitting diode screen exposure in male teenagers. *Journal of Adolescent Health*, *56*(1), 113-119.

Watson, N. F., Badr, M. S., Belenky, G., Bliwise, D. L., Buxton, O. M., Buysse, D., Dinges, D. F., Gangwisch, J., Grandner, M. A., Kushida, C., Malhotra, R. K., Martin, J. L., Patel, S. R., Quan, S. F., & Tasali, E. (2015). Joint Consensus Statement of the American Academy of Sleep Medicine and Sleep Research Society on the Recommended Amount of Sleep for a Healthy Adult: Methodology and Discussion. *J Clin Sleep Med*, *11*(8), 931-952. https://doi.org/10.5664/jcsm.4950

Weaver, E., Gradisar, M., Dohnt, H., Lovato, N., & Douglas, P. J. J. o. C. S. M. (2010). The effect of presleep video-game playing on adolescent sleep. *6*(02), 184-189.

WHO. (2018, 28/09/2018). *Global Accelerated Action for the Health of Adolescents (AA-HA!): guidance to support country implementation*. https://www.who.int/maternal_child_adolescent/topics/adolescence/framework-accelerated-action/en/