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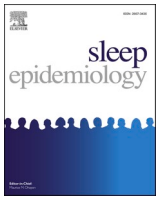

Prevalence of sleep disturbances and factors associated among school going children in Uganda, a cross-sectional study

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ABSTRACT

Background: Sleep disturbances greatly impact children's academic performance and social well-being. This study set out to determine the prevalence of sleep disturbances and factors associated among school going children in Kawempe division, Kampala, Uganda.

Methods: In a community cross-sectional study, 548 study participants using random cluster sampling were enrolled. The children start lessons at 8am and end the days classes at 5pm. Random cluster sampling method was used to select participants from the 19 parishes in Kawempe district. Data was collected using a semi-structured questionnaire and Sleep Disturbance Scale for Children (SDSC). Descriptive statistics and multivariate binary logistic regression were performed with a $p < 0.05$ level of significance, and a 95 % confidence interval as a measure of association between the sleep disturbance.

Results: Abnormal total sleep score (T- score >70) was at 3.5 %, and overall, 21.7 % of the children had an abnormal score on at least one SDSC factor. Among the children with sleep disturbances, we noted the following factors; use of an electronic device before bed, sleeping <7 h at night, having unemployed parents and lack of regular parental interaction.

Conclusion: Better understanding of sleep disturbances in needed to address challenges associated with sleep among children in Uganda.

1. Introduction

Sleep disturbances greatly impact the cognitive function and academic performance of school going children as well as interfering with emotional and behavioral regulation among other problems [1–5]. In children, several factors such as reduced participation in physical activity and sports, the screen behavior and electronic media use (mobile devices, television, video games, and the internet) have been reported to be associated with sleep disturbances [6,7]. Studies in Africa, have reported insufficient sleep among urban-dwelling adolescents on weekdays with 40 % reporting excessive daytime sleepiness [8]. A prevalence of 28.9 % was reported in a study of children in Libya [9] and 6.3–26.4 % was reported in a study of adolescents from Nigeria [10,11]

However, due to differences in physical, environmental, economic, social, and cultural factors, the reported factors may be different in Ugandan school going children. Earlier studies conducted in Uganda, have reported a 32 % and 56 % prevalence of sleep disturbances in children with cerebral palsy and secondary school students, respectively [12,13]. However, none has focused on primary going children especially in the urban settings who seem to suffer from the related traffic

Abbreviations: BMI, body mass index; CP, cerebral palsy; DA, disorders of arousal; DIMS, disorders in initiation and maintenance of sleep; DOES, disorders of excessive somnolence; EEG, electroencephalogram; EMG, electromyogram; EOG, electrooculogram; NREM, non-rapid eye movement; OSA, obstructive sleep apnea; PQSI, Pittsburg quality sleep index; PSDQ, pediatric sleep disturbance questionnaire; PSG, polysomnography; REM, rapid eye movement; SDSC, sleep disturbance scale for children; SHY, sleep hyperhydrosis; SWTD, sleep-wake transition disorders; WASO, wake after sleep onset.

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jams and delays hence setting off early to school. Whereas, poor sleep exists among both rural and urban-dwelling adolescents, children among urban populations tend suffer from sleep deprivation and daytime sleepiness [11,14,15]. In urban settings, environmental noise, technology use before bedtime, artificial light exposure at night, school-related demands, traffic related delays and family dynamics have been reported to be the major determinants of sleep health(11, 14). Understanding the burden of sleep disturbances among primary school children is needed to develop strategies in improving their social well-being. To our knowledge, there are no studies that have described the prevalence and associated factors among primary school children in Uganda. Therefore, this study aims to explore the prevalence and associated factors with sleep disturbances in primary school children in Uganda.

2. Methods

2.1. Study design

This was a community cross-sectional study involving children aged 6–17 and their immediate caregivers.

2.1.1. Study setting

The study was conducted in Kawempe, one of the five divisions in Kampala the capital city of Uganda from November 2022 to May 2023. Kampala city proper has approximately 1.6 million people of which a little over 700,000 are below the age of 19 years. Kawempe division is located in the northern part of Kampala bordering Wakisodistrict with a projected population of 377,700 people which is the highest population density of the 5 divisions [16]. It consists of 19 parishes and 771 villages. The inhabitants are of all social and economic statuses including ghettos.

Overall, there are 715 primary schools in Kampala city, of which 124 are in Kawempe schools. Thirteen of the school are government aided while the rest are privately owned [16]. They are very competitive schools focused on performance. The average primary school enrolment rate in Kampala is 85 % with a gender parity of 1.1. Kampala also registers the highest primary seven enrolment rate at 25 % and also close to 85 % of pupils live within 3 km from the school premises according to UBOS [16]. Most of the schools around the Kawempe division start lessons on average at 8am and end at 5pm; however. English is the official language used in schools and offices. Most schools often have a 30-min break and a one-hour lunch break. Some children are picked up from home and dropped off using the school shuttle or bus service, which often starts movements as early as 5 a.m. and drops off pupils later after school until the last one gets home.

2.2. Study participants

Participants were children attending primary school within Kawempe division aged 6 to 17 years. The study inclusion criteria included: Children in day school aged 6 to 17 years, whose caregivers or parents understood English or Luganda and should have been staying with the same child for a period of the last 6 months. The parent/caretaker was required to give consent while a child aged 8 years and above had to give assent to be part of the study. We did not exclude any children as long as they were attending primary school.

2.3. Sample size calculations

A total sample size of 409 participants was estimated using Kish Leslie's (1965) formula for study objective one, based on the prevalence of sleep disturbance in secondary school children of 59 % with a 10% non-response adjustment(13).

For calculating sample size for factors associated with sleep disturbance, we used the Kelsey Fleiss formula for calculating the sample size for factors associated with sleep disturbances, With the aid of Open Epi software, we used a study by Ahinkorah B et al. which demonstrated that anxiety-induced sleep disturbance among in-school adolescents was significantly influenced by feeling lonely compared to those that never felt lonely (aOR = 2.82, CI = 1.98, 4.01) [17]. Using this study done in Ghana inserting the odds ratio in https://w.openepi.com/SampleSize/SSCohort.htm the sample size required will be 456 participants. The two-sample size calculated, the bigger sample of 456 for factors associated was considered and adjusted by 20 % to cater for none responses Therefore the required sample size for this study was 548 participants.

2.4. Sampling procedure

Kawempe division was purposively chosen because of its high population density. It consists of 19 parishes. A random cluster sampling method was used to select participants from each parish. Using population proportions, the sample size was distributed among the 19 parishes. The first household in an enumeration area to be selected was identified by standing in the center of the enumeration area and spinning a bottle on clear level ground. The direction in which the tip of the bottle faced was followed moving from the center towards the edge of each enumeration area with the help of a village health team member (VHT) who helped sensitize parents. In cases where more than one child was eligible in a household, only one was randomly sampled from those that were available. All eligible school-age children were consecutively enrolled from each household into the study until a desirable sample size of 548 is obtained.

2.5. Study procedure

The study team which consists of research assistants and the principal investigator were trained on the approved study protocol, approved data collection tools, ethics, and operating procedures before the start of the study. And roles were assigned. The study team was oriented on the study setting. The Semi-structured questionnaire was pretested on 15 participants for understanding. The Village Health Teams (VHTs) mobilized children and their caretakers from the community before the onset of the study. Caregivers of eligible participants were asked for written informed consent in either English or Luganda. All study participants were screened with the Sleep Disturbances Scale for children (SDSC) questionnaire(18). Participants were then stratified according to total SDSC score. A total score (TS) $\geq$ 51 on the Sleep Disturbances Scale for Children (SDSC) was regarded as sleep disturbances. The questionnaire was cultural adapted and pretested in an earlier study in Uganda. The internal consistency was high in controls (0.79) and remains at a satisfactory level in sleep disturbances subjects (0.71); the test/pretest reliability is adequate for the total (I. =0.71) [12]. The questionnaire considers symptom as pertaining to the past 6 months of the child's life. The Sleep Disturbance Scale for Children (SDSC) is a 26-item instrument for evaluating sleep. The demographic factors, medical history including a description of chronic illnesses, drugs taken, comorbidities, sleeping habits, screen time, psychosocial, and family social history were recorded on a data collection tool. The children's height and weight were also taken and their BMI was calculated and adjusted for BMI for age using WHO charts for BMI for age. The forms were then checked for completeness by the study investigators.

2.6. Subscale of sleep disturbance scale

Night awakenings/ disorders of arousal. These are spontaneous arousals from sleep after going to bed. A child with one or few awakenings was considered to have good quality sleep, while four or more are considered poor sleep according to NSF [19]. Under this, we have disorders like sleepwalking, sleep terrors and nightmares [20]. To get these disorders, we summed up the score of items 17, 20, and 21 on the SDSC.

Sleep-wake transition disorder (SWTD). This attribute can be

measured objectively or subjectively. It focuses on how long one stays awake after arousal from sleep, according to NSF. This includes disorders like, hypnic jerks, rhythmic movement disorders, hypnagogic hallucinations, nocturnal hyperkinesia, sleep talking and bruxism [20]. To get these disorders, we summed up the score of items 6, 7, 8, 12, 18, and 19 on the SDSC.

Disorder of excessive somnolence (DOES). This includes daytime sleepiness, sleep attacks, feeling sleepiness, or getting fatigued while performing routine daily tasks like reading or watching TV. This attribute is often associated with sleep disturbances such as sleep paralysis, bed-wetting and parasomnias [20]. To get these disorders, we summed up the score of items 22, items 13, 14, and 15 on the SDSC.

Sleep hyperhidrosis (SHY). These disorders include falling asleep sweating and night sweating. To get these disorders, we summed up the score of items 9,16 on the SDSC [20].

The original Sleep Disturbance Scale for Children (SDSC) has the sum of scores that provides a total sleep score with a possible range from 26 to 130 measured as continuous variables. But will be dichotomized for further analysis Pupils were considered as having sleep disturbance if the overall total T-scores was greater than 70 from the raw total score of parents' responses to 26 items and were coded 1 otherwise coded zero for no sleep disturbance. The same was done for the subscales. 23, 24, 25, and 26 on the SDSC.

Disorders of Initiation and Maintaining of Sleep (DIMS). This is a reluctance to fall asleep even when one wants to sleep and has trouble maintaining a sleeping state. These disorders were obtained by summation of the score of items 1, 2, 3, 4, 5, 10, and 11 on the SDSC.

Breathing Disorders. The category of sleep disturbances consists of disorders like snoring, sleep apnea, and breathing problems. To get these disorders, we summed up the score of 23, 24, 25, and 26 on the SDSC [20].

2.7. Study variables

2.7.1. Dependent variables

The outcome variable was sleeping disturbances where a cut-off of T-score >70 for the six subscales of sleep disturbance which was dichotomized and define as the presence of a sleep disturbance coded 1 and absence of sleep disturbance coded 0. Which included six subcategories of sleep disturbances. (i.e., Sleep Hyperhidrosis, DIMS, sleep Breathing Disorder, excessive somnolence, Sleep-wake Transition Disorders, Disorder of arousal).

2.7.2. Independent variables

Patient Demographics and Psychosocial Factors

These included: age, class, gender, family size, education level of parents, BMI for age, type of school (government or private), school-associated factors (bullying, few friends)

Children's sleep insufficiency factors.

These included bedtime, wake-up time, duration of sleep, sleep distractions like television before bed, use of phone or computer in bed, and Bedwetting.

Sleep Environment Factors.

These included: sleeping with lights on, noisy environment, sharing a bed with others, sharing a crowded room with other people, cold or very humid or hot bedroom, and watching television in the bedroom.

Sleeping habits

These included taking a heavy meal before bedtime, varying bedtime, varying wake time, using a cell phone just before bed, watching television or using a computer right before bedtime, using the bed and bedroom for other activities, and heavy activity/play before bedtime.

Screen time factors

These factors included the use of electronic gadgets before bedtime., i.e., TV, cell phone, computer, video games encroaching on bedtime, and addiction to gadgets.

Medications and chronic illnesses

History or presence of chronic illness:(e.g., epilepsy, ADHD), chronic use of particular medication: drug-like. (E.g., Melatonin, an antihistamine.), depression and anxiety

Parent and caregiver factors.

These factors included the parent's age, education level of parents or caregiver, occupation of parents, marital status of parents/caregiver, time spent with the child(ever-present), the health status of the guardian, and relationship with the child (good or not good), wealth index.

2.8. Statistical analysis

Data was entered using Epi data version 4.4.1 and exported into Stata version 14.0 for analysis. Means with their standard deviations were presented in the case of continuous variables, and percentages and frequencies were presented for categorical variables.

The frequency of individual items in the SDSC (Sleep Disturbance Scale for Children) was determined, and statistical analyses and calculations for SDSC subscales were conducted. Difficulties occurring three or more times per week were identified as problematic, following the same definition used in previous research involving preschool-aged children [21].

A scoring sheet was developed by deriving T-total scores, a type of standardized score that can be mathematically transformed into other types of standardized scores, from both the SDSC raw total score and individual factor raw scores. The standard formula [T-score = 50 + ((Value - Mean) / Standard Deviation)) * 10] was used for this calculation. A cut-off point was established, classifying a T-score above 70 as "pathological" and a T-score between 50 and 70 as "suspect/borderline." based on studies that have used the same tool [18,21].

For prevalence, individuals with T-scores above 70 in the individual factors as well as from the total scores on the SDSC were considered for the outcome. Participants were then stratified according to the total SCDC score and bivariate analysis was conducted. Chi-square or Fisher's exact test was used for categorical variables. Multivariable analysis was undertaken using the binary logistic regression model to assess the relationship between sleep disturbances in primary school children by looking at factors such as social demographics, characteristics, children's sleeping habits and their environmental factors, and parent/caregiver factors. For multivariable analysis, factors with a p-value <0.2 were entered in the logistic regression analysis. P-values <0.05 were considered significant and associated with the outcome.

3. Results

A total of 548 participants were enrolled in the study, the mean age (±SD) of all children was 10.3 ± 2.6 years, and most participants 297 (54.2 %) were female. Only 164 (29.9 %) of the children were enrolled in government public schools while the rest were enrolled in private schools. Almost half 267(49.4 %) of the pupils were in lower primary (Primary one to three). Among the study participants, 3.5 % (19/548) were classified as obese and 2.7 % (15/548) were underweight, see Table 1 below.

Regarding the children's sleeping habits, most parents 462(84.3 %) played or interacted with their children. About 2.7 % (15/548) of the parents/caretakers reported that their children were addicted to electronic gadgets while 59(10.8 %) admitted to their children using either a phone/tablet or computer within an hour of bed. More than three-quarters (433) of the parents or caregivers reported that their children at least watched TV one hour within sleeping time. A quarter (137) of the parents reported that their children slept with lights at night, while 93(17 %) of the parents reported to have been staying in a noisy environment.

Of the enrolled children 125(22.8 %) reported having ever complained about the bedroom being too hot. Nearly, 91 % (496/548) of the children shared a bedroom with one other person while about half of the

Table 1
Socio-demographics characteristics of children aged 6 – 17 years in Kawempe division.

Variables	Frequency (n = 548)	Percentage %
Type of school		
Private	384	70.1
Government	164	29.9
Age of pupil		
≤8 years (early childhood)	161	29.4
9–11 years (middle children)	187	34.1
12 and above (early adolescents	200	36.5
Sex of the child		
Male	251	45.9
Female	296	54.1
Class of the pupil		
P 1–3(Lower primary)	267	17.5
P 4–5(Middle primary)	126	14.8
P 6–7(Upper primary)	155	16.4
Estimated distance from school		
≥5km	103	18.8
>5km	445	81.2
Number of family members		
≤5 people	217	39.6
>5 people	331	60.4
Having many friends at school?		
Yes	527	96.2
No	21	3.8
Ever been bullied/ Harassed at school		
Yes	88	16.1
No	458	83.9
Ever gone hungry to school		
Yes	80	14.6
No	468	85.4
Child feeling lonely at home		
Yes	33	6.1
No	515	93.9
BMI		
Obese	19	3.5
Overweight	56	10.4
Normal	328	60.6
Thin	123	22.7
Underweight	15	2.8

participants 266(48.5 %) shared a bed with another sibling or any other person. A few participants 11(2 %) were deemed less social and 73(13.3 %) took a heavy meal before bedtime (Table 2).

A total of 7.2% (39/548) of the children reported a chronic medical condition with four reporting epilepsy, two attention-deficit/ hyperactivity disorder (ADHD), five reported asthma, three had HIV and three reported mental illness, while five reported sickle cell disease, 6 reported recurrent chronic headaches and 11 reported taking daily medications for unspecified diseases.

The mean age(±SD) of the parents/caretaker was 37.9 ± 9, with most parents 376(56 %) being <40 years old, the heads of the households were predominantly male 349(63.7 %), 313(57.2 %) of the parents/caregivers were married. More than a half 294(53.7 %) of the household head attained secondary level of education. Majority of the children (471/544) of the children stayed with their parents with 346 (63.1 %) of the parents reported being self-employed, and over 90 % of caregivers reported having either a good or very good relationship with their children with majority (386/548) of the families living in rented houses. The analysis showed that less than half (45.4 %) of the children slept 8–9 h in a night. A half of the children took <15 min (50 %) while 42 % took between 15 and 30 min to fall asleep after going to bed.

3.1. Prevalence of sleep disturbances in primary school children

Overall, out of 548 participants, the prevalence of sleep disturbance was 119(21.7 %), 95 % CI (18.5–25.4); SDSC with Sleep Breathing Disorder being the most prevalent. Based on the T-total score of 50, we identified the value of 37 as a cut-off for the total SDSC raw score. The same was done for the single factors DIMS, SBD, DOES, DA, SWTD, and SHY, with cut-off raw sores of 10, 3, 3, 8, 6, and 3 respectively. A total of 248(45.3 %) participants had a total raw score of 39 and above indicating children who were both at risk of sleep disturbances or with sleep disturbances (Table 3). For T-scores >70 the prevalence of SBD was at

Table 2
Children's sleeping habits and environmental factors.

Variables	Frequency (n = 548)	Percentage %
Use of phone/tablet or computer at bed time.		
Yes	59	10.8
No	489	89.2
Watching TV before sleeping		
Yes	433	79.1
No	115	20.9
Suspected child's addicted to electronic garget		
Yes	15	2.7
No	533	97.3
Child bed wet		
Yes	74	13.5
No	474	86.5
Parent always playing/interacting with your child when home.		
Yes	462	84.3
No	86	15.7
Varying bed time		
Yes	88	16.1
No	460	83.9
Napping during the day		
Yes	59	10.8
No	489	89.2
Sleep environment factors		
Child sleeping with lights on		
Yes	137	25
No	411	75
Noisy Environment		
Yes	93	17.0
No	455	83.0
Shared the bedroom		
Yes	496	90.5)
No	52	9.5
Shared BED		
Yes	266	48.5
No	282	51.5
Complained of hot bedroom		
Yes	125	22.8
No	423	77.2
Heavy meal before bedtime		
Yes	73	13.3
No	475	86.7
Child always socialize with other children		
Yes	537	98.0
No	11	2.0
Psychosocial Factors		
Anxiety		
Present	10	1.8
Absent	538	98.2

Table 3
Sleep disorders score.

Score	Score range	Means SD, (n,%)	T-Score >50 (f,%)	Cut off T-score70	T-Score >70 (f,%)
DIMS	7–35	10.7 ± 2.6	239(43.6)	≥16	27(4.9)
SBD	3–15	3.7 ± 1.5	155(28.3)	≥7	41(7.5)
DOES	5–25	6.4 ± 2.5	186(33.9)	≥11	33(6.0)
DA	3–15	3.9 ± 1.3	264(48.2)	≥7	27(4.9)
SWTD	6–30	8.6 ± 2.4	268(48.9)	≥14	20(3.7)
SHY	2–10	3.6 ± 1.9	235(42.9)	≥8	24(4.4)
Total score (SUM)	26–130	36.9 ± 6.9	248(45.3)	≥51	19(3.5)

7.5 % (most prevalent) and the lowest was SWTD at 20(3.7 %).

3.2. Factors associated with sleep disturbances

We determined the factors associated with sleep disturbances in primary school children by looking at factors such as social demographics, characteristics, children's sleeping habits and their environmental factors, and parent/caregiver factors.

All factors with a p-value < 0.2 on bivariate analysis were entered in a logistic regression model to determine risk factors independently associated with sleep disturbances at multivariate analysis.

In bivariate analysis, the age of the pupil (9–11 years), class of the pupils (P1-P3), if the child has ever gone to school hungry and being overweight were carried on. Additionally, children who used of phone before bed, parents interacting with the child, sharing bed and complaining of the hot room factors were carried on to multivariate analysis. Children who used an electronic gadget (i.e., phone, tablets or computer) were twice as likely to have a sleep disturbance [COR= 2.02, 95 % CI (1.13–3.62), p-value 0.018] compared to the counterparts.

There were no significant associations with the type of school attended, age of pupils, sex of the children, number of family members, having many friends at school and distance from school with p-values of 0.754, 0.130, 0.654, 0.852, 0.763 and 0.665, respectively. see Table 4.

Table 4
Bivariate analysis of Socio-demographics characteristics of children.

Variable	Sleep disturbance		cOR 95 % CI	P value
	Absent (*n* = 429) (f,%)	Present (*n* = 119) (f,%)		
Age of pupil				
≤ 8 years (early childhood)	117 (27.3)	44(36.9)	1.0	
9–11 years (middle children)	153 (35.7)	34(28.6)	1.46 (0.89,2,38)	0.130
12 and above (early adolescents	159 (37.1)	41(34.5)	0.86 (0.52,1.43)	0.564
Class of the pupil				
P1–3(Lower primary)	201 (46.9)	66(55.5)	1.63 (0.98,2.69)	0.058
P4-p5(Middle Primary)	99(23.1)	27(22.7)	1.35 (0.74,2.46)	0.322
P 6-p7(Upper primary)	129 (30.1)	26(21.9)	1.0	
Ever been harassed/bullied at school				
Yes	67(15.7)	21(17.7)	1.15 (0.67,1.97)	0.608
No	360 (84.3)	98(82.3)	1.0	
Ever gone hungry to school				
Yes	55(12.8)	25(21.1)	1.81 (1.07,3.05)	0.027
No	374 (87.2)	94(78.9)	1.0	
Child feeling lonely at home				
Yes	23(5.4)	10(8.4)	1.62 (0.75,3.50)	0.221
No	406 (94.6)	109 (91.6)	1.0	
BMI				
Normal	261 (60.8)	74(62.2)	1.0	
Overweight	48(11.2)	8(6.7)	0.59 (0.27,1.30)	0.188
Obesity	14(3.3)	5(4.2)	1.29 (0.44,3.61)	0.668
Thin	94(21.9)	29(24.4)	1.08 (0.67,1.77)	0.735
Underweight	12(2.8)	3(2.5)	0.88 (0.24,3.21)	0.849

Parents playing and interacting with their children were protective with parents who didn't play with their children [COR=1.97, 95 % CI (1.19–3.26), p-value=0009] approximately twice likely to have children with sleep disturbances compared to others. Also, Children who shared a bed with someone else were more likely to experience a sleep disturbance [COR=1.69, 95 % CI (1.13–2.56), p-value 0.012]. Children who complained of a hot room were almost twice as likely to experience sleep disturbance compared to others who had no complaints of the hot room [COR=1.75, 95 % CI (0.11–2.75), p-value - <0.016]. children who sleep for ≤7 h were twice more likely to have sleep disturbance compared to children 9–11 h [COR=2.68, 95 % CI (1.17,6.90) p value 0.028] as shown in Table 5 below.

Still, at bivariate analysis, results indicated that children of parents aged between 31 and 40 years, those with secondary school as a high level of education, where their children were less likely to have sleep disturbance however children whose parents were employed or self-employed were more likely to have a statistically significant sleep disturbance (Table 6)

At the multivariate level the finding revealed that Pupils aged 9–11 years were less likely to have sleep disturbance compared to pupils aged 8 years below and the association was statistically significant [aOR= 0.52, 95 % CI (0.30,0.91), p-value 0.022] early adolescent pupils were also less likely to have sleep disturbance compared to their counterpart however the association was not statistically significant at 5 % aOR=0.61, 95 % CI: (0.35,1.08), p-value 0.091]

On sleep hours, pupils who reported to sleep for 7 or fewer hours [aOR=2.80, 95 % CI:(1.06,7.39), p-value 0.038] were almost thrice more likely to have sleep disturbance compared to those who slept for 9–11 h an association was statistically significant.

Results also indicated that a parent/caregiver playing and interacting with the child before bed was protective. Pupils whose parents reported not having been playing and interacting with were almost twice more likely to have sleep disturbance compared to those whose parents were playing and interacting with them and this was statistically associated and independently significant [aOR=1.8395 % CI (1.04,3.22), p-value 0.037]

Furthermore, pupils who used a phone before sleeping were twice more likely to have sleep disturbance compared to pupils who did not use the phone and the association was statistically significant at 5 % [aOR= 2.08 95 % CI (1,07,4.06), p-value 0.031]

On the caretaker factors, the age of the caretakers and occupation were the factors that were statistically significant. Finding shows that pupils of caretakers aged 31–40 years were less likely to have sleep disturbances compared to those whose caretakers were 30 years below [aOR= 0.46, 95 % CI (0.26,0.82), p-value 0.009]. Pupils whose caretakers were not employed or engaged in any formal kind of employment were three times more likely to have sleep disturbances compared to those employed (civil/ NGO) and the association was statistically significant [aOR= 3.31, 95 % CI (1,49,7.37), p-value 0.003] as shown in Table 7

4. Discussion

This was a cross-sectional study that aimed to determine the prevalence and factors associated with sleep disturbances in primary school children in Kawempe division. In this study, 21.7 % of primary school going children had one or more sleep disturbances and the most prevalent disorder was sleeping breathing disorder at 7.5 %. This is prevalence rate was lower than earlier studies in secondary school and children with cerebral palsy [12,13]. This might be attributed to differences in age, use of the Pittsburgh Sleep Quality Index (PSQI) which could be another reason for the differences and study settings. While the study in cerebral palsy children used the SDSC tool, it focused on cerebral palsy children, hence might not reflect appropriately among those without cerebral palsy. However, a similar study elsewhere reported similar findings with prevalence of 25.8 % in Portugal [22].

Table 5
Bivariate analysis of children's sleeping habits and environmental factors.

Variable	Sleep disturbance		Cor 95 % CI	P value
	Absent ($n = 429$) (f,%)	Present ($n = 119$) (f,%)		
Use of phone/tablet or computer at bedtime				
Yes	39(9.1)	20(16.8)	2.02 (1.13,3.62)	0.018
No	390 (90.9)	99(83.2)	1.0	
Watching TV before sleeping				
Yes	340 (79.3)	93(78.1)	0.94 (0.57,1.53)	0.794
No	89(20.8)	26(21.9)	1.0	
Suspect child is addicted to electronic garget,				
Yes	10(2.3)	5(4.2)	1.84 (0.61,5.48)	0.275
No	419 (97.7)	114 (95.8)	1.0	
Child bed wetting				
Yes	55(12.8)	19(16.0)	1.29 (0.73,2.27)	0.375
No	374 (87.2)	100 (84.0)	1.0	
Parent always playing/ Interacting with your child when home				
Yes	371 (86.5)	91(76.5)	1.0	
No	58(13.5)	28(23.5)	1.97 (1.19,3.26)	0.009
Varying bed time				
Yes	64(14.9)	24(20.2)	1.44 (0.85,2.42)	0.169
No	365 (85.1)	95(79.8)	1.0	
Child napping during the day				
Yes	48(11.2)	11(9.2)	0.81 (0.41,1.61)	0.545
No	381 (88.8)	108 (90.8)	1.0	
Sleep environment factors				
Child sleeping with light on.				
Yes	106 (24.7)	31(26.1)	1.07 (0.67,1.71)	0.765
No	323 (75.3)	88(73.9)	1.0	
Noisy environment				
Yes	75(17.5)	18(15.1)	0.84 (0.48,1.47)	0.545
No	354 (82.5)	101 (84.9)	1.0	
Shared the bedroom				
Yes	389 (90.7)	107 (89.9)	0.92 (0.46,1.81)	0.802
No	40(9.3)	12(10.1)	1.0	
Shared BED				
Yes	196 (45.7)	70(58.8)	1.69 (1.13,2.56)	0.012
No	233 (54.3)	49(41.2)	1.0	
Complained of hot bedroom				
Yes	88(20.5)	37(31.1)	1.75 (0.11,2.75)	0.016
No	341 (79.5)	82(68.9)	1.0	
Heavy meal before bedtime.				
Yes	56(13.1)	17(14.3)	1.11 (0.62,1.99)	0.726
No	373 (86.9)	102 (85.7)	1.0	
Child socializing with other children				
Yes	420 (97.9)	117 (98.3)	1.25 (0.27,5.88)	0.774
No	9(2.1)	2(1.7)	1.0	
Psychosocial Factors				
Anxiety				
Present	8(1.9)	2(1.7)	0.99 (0.18,4.29)	0.894
Absent	421 (98.1)	117 (98.3)	1.0	
Hours of sleep on most nights				
9–11hr	132 (30.8)	29(24.4)	1.0	
8–9hr	194 (45.2)	55(46.2)	1.29 (0.78,2.13)	0.319
7–8hr	86(20.1)	25(21.2)	1.32 (0.73,2.41)	0.360
<7hr	16(3.7)	10(8.4)	2.68 (1.17,6.90)	0.028
Medical condition				
Chronic illness	18(4.2)	8(6.7)	1.65 (0.69,3.88)	0.256
No chronic illness	411 (95.8)	111 (93.3)	1.0	

Compared to studies elsewhere, in Nigeria, some studies reported a lower prevalence while some had a higher value compared to this study and this could be attributed to different scales used to assess sleep quality. M. A. Stein et al. in a study looking at sleep and behavior problems in school-age children, aged 4- 12 years in Nigeria demonstrated a prevalence of 10.8 % global sleep problems which was far less compared to this study, the most prevalent disorder being snoring and tiredness during the day contrary to this study [23]. This could be because of the use of a different scale (sleep behavior questionnaire) and the prevalence was calculated using the global scores. The individual different types of sleep problems were reported differently as well.

In this study, SBD (7.5 %) was more prevalent and over 70 % of the children slept >8–9 h on most days and over 90 % require <30 min to fall asleep. This is similar to studies elsewhere where children had an average sleep time was 8.9 h [24], Chinese study reported at least >8 h on most nights [21].

The difference in the prevalence between Uganda and other countries could be explained in part by the cultural difference, the fact that the SDSC was probably administered in a single language.

In this study, children aged 9 to 11 years were less likely to have sleep disturbances in aOR- 0.52 (P-value of 0.035). Children during this prepubertal period may have not yet experienced hormonal changes linked to sleep patterns disruption. A study by Sadeh et al. noted that higher level of pubertal ratings was associated with delayed sleep onset, reduced true sleep time, increased number of nights wakings, and reduced sleep efficiency [25]. This is similar with earlier studies that have reported children between 9 and 11 may have difficulty falling asleep as the most frequent insomnia which might be attributed to increased sleep-related anxiety or hyperarousal at bedtime or it might be due to emerging or concurrent mood or anxiety disorders [26–28]. By the ages of 9 to 11 years, children have typically passed the stage of early childhood, where sleep-related difficulties like frequent night waking or bedtime resistance are more common. They have developed better sleep-wake regulation and have more established sleep patterns.

Children in this age group may have fewer external factors that interfere with sleep, such as frequent night feedings, diaper changes, or teething issues that are more common in infants and toddlers. A study by Senbanjo et al's study noted a decrease in sleep disorder as the children grow older [24].

In this study, children whose parents didn't interact with them often were almost 2 times like to have sleep disorders. Parents/caregivers being more present, especially at bedtimes was protective against sleep

Table 6
Bivariate analysis of parent and caregiver factors.

Variables	Sleep disturbance		cOR, 95 % CI	P value
	Absent (*n* = 429) (f,%)	Present (*n* = 119) (f,%)		
Parent/caregiver's age				
18–30 years	88 (20.5)	35 (29.4)	1.0	
31–40 years	200 (46.6)	44 (36.9)	0.55(0.33,0.92)	0.023
40 and above	141 (32.9)	40 (33.6)	0.71(0.42,1.21)	0.208
Sex of the household head				
Male	268 (62.5)	81 (68.1)	1.0	
Female	161 (37.5)	38 (31.9)	0.78(0.51,1.20)	0.262
Highest level of Education of the household head				
None	7(1.6)	3(2.5)	1.0	
Primary	75 (17.5)	25 (21.0)	0.78(0.19,3.24)	0.730
Secondary	238 (55.5)	56 (47.1)	0.55(0.14,2.19)	0.396
Tertiary/degree	109 (25.4)	35 (29.4)	0.75(0.18,3.05)	0.687
Highest level of Education of the mother				
None	14(3.2)	7(5.8)	1.0	
Primary	107 (24.9)	40 (33.6)	0.75(0.28,1.98)	0.560
Secondary	229 (53.4)	47 (39.5)	0.41(0.16,1.07)	0.069
Tertiary/degree	79 (18.4)	25 (21.1)	0.63,0.22,1.74)	0.376
Relationship with the pupil				
Parents	365 (85.1)	106 (89.1)	1.0	
Siblings	16(3.7)	3(2.5)	0.65(0.18,2.26)	0.493
Uncle/aunt	10(2.3)	3(2.5)	1.03(0.28,3.82)	0.961
Grandparents	38(8.9)	7(5.9)	0.63 (,0.28,1.46)	0.285
Occupation of caregiver				
Not employed	82 (19.1)	35 (29.4)	12.16 (1.08.4.34)	0.030
Employed self	276 (64.3)	70 (58.8)	1.29(0.68,2.42)	0.434
Employed civil/NGO	71 (16.6)	14 (11.8)	1.0	
Parent/caregiver's marital status				
Single	147 (34.3)	37 (31.1)	1.0	
Married	282 (65.7)	82 (68.9)	1.16(0.75,1.78)	0.517
Rating of relationship with the child				
Very Good	271 (63.2)	76 (63.9)	1.0	
Good	154 (35.9)	42 (35.3)	0.97(0.64,1.49)	0.898
Average	4(0.9)	1(0.8)	0.89(0.09,8.09)	0.919
What is the home ownership status				
Own	123 (28.7)	39 (32.8)	1.12(0.78, 1.88)	0.386
Rents	306 (71.3)	80 (67.2)	1.0	

disorders. Enforcing routines and behaviours like consistent bedtime routines like bathing, reading a book and engaging in calming activities like prayer and a consistent bedtime may be key. Parents are also likely to limit stimulating activity like exposure to electronics (TV, phones), and also create a sleep-conducive environment (clean, quiet,

Table 7
Multivariable analysis of factors associated with child sleep disturbance.

Variable	cOR, 95 % CI	P value	aOR, 95 % CI	P value
Age of pupil				
≤8 years (early childhood)	1.0		1.0	
9–11 years (middle children)	1.74(1.14,2.65)	0.010	0.52(0.30, 0.91)	0.022
12 and above (early adolescents	1.39(0.93,2.08)	0.111	061(0.35, 1.08)	0.091
Ever gone hungry to school				
Yes	1.58(0.98,2.55)	0.059	0.72(0.39, 1.32)	0.292
No	1.0			
BMI				
Normal	1.0		1.0	
Overweight	0.59/ 90.27,1.29)	0.188	0.63(0.27, 1.50)	0.306
Obese	1.29(0.44,3.61)	0.668	1.14(0.35, 3.71)	0.833
Thin	1.08(0.67,1.77)	0.735	1.06(0.63, 1.8)	0.826
Under weight	0.88(0.24,3.21)	0.849	0.50(0.12, 2.05)	0.338
Use of phone/tablet or computer at bed time				
Yes	2.02(1.13,3.62)	0.018	2.08(1.07, 4.06)	0.031
No	1.0			
Parent always playing/ interacting with the child when home				
Yes	1.0		1.0	
No	1.97(1.19,3.26)	0.009	1.83(1.04, 3.22)	0.037
Varying bed time				
Yes	1.44(0.85,2.42)	0.169	1.11(0.62, 2.03)	0.716
No	1.0			
Shared the BED				
Yes	1.73(1.24,2.44)	0.001	1.53(0.95, 2.46)	0.077
No	1.0			
Complained of hot bedroom				
Yes	1.75(0.11,2.75)	0.016	1.64(0.96, 2.81)	0.78
No	1.0			
Occupation of caregiver				
Not employed	2.16(1.08.4.34)	0.030	3.31 (1.49,7.37)	0.003
Employed self	1.29(0.68,2.42)	0.434	1.44 (0.71,2.92)	0.315
Employed civil/NGO	1.0		1.0	
Highest level of education of the mother				
None	1.0			
Primary	0.75(0.28,1.98)	0.560	0.68(0.24, 1.99)	0.488
Secondary	0.41(0.16,1.07)	0.069	0.41(0.14, 1.17)	0.094
Tertiary/degree	0.63,0.22,1.74)	0.376	0.95(0.30, 2.97)	0.930
What is your age in complete years				
18–30 years	1.0			
31–40 years	0.55(0.33,0.92)	0.023	0.46(0.26, 0.82)	0.009
40 and above	0.71(0.42,1.21)	0.208	0.58 (0.38,1.28)	0.077
Child's hours of sleep on most nights				
9–11hr	1.0			
8–9hr	1.29(0.78,2.13)	0.319	1.4(0.83, 2.52)	0.196
7–8hr	1.32(0.73,2.41)	0.360	1.6(0.64, 2.5)	0.509
<7hr	2.68(1.17,6.90)	0.028	2.8(1.06, 7.39)	0.038

cOR: crude odds ratio, CI; confidence interval, aOR: Adjusted odds ratio.

comfortable dark room for sleep). An available parent who interacts with his child will most likely engage in bedtime conversation and have a higher chance of identifying sleep problems in the same child and addressing them [29].

Electronic use was significantly associated with sleep disorders in this study. 16.8 % of children with disturbed sleep used electronic devices like a phone tablet or computer in bed and they were 2 times more like to have sleep disorders. Gadgets' screens emit blue light which interferes with the natural production of melatonin, a hormone that regulates the sleep-wake cycle. It also delays sleep onset due to due to stimulating activities on them like games and browsing social media. This disrupts bedtime routines due to fragmented sleep hence the various sleep disorders [30,31].

Children whose parents were aged parents aged 31 to 40 years were less likely to have sleep disorders. This might be due to that fact that parents between 30 and 40 years are typically focused on establishing and advancing their careers. Hence likely to establish routines like regular sleep schedules and predictable bedtime rituals which may contribute to better quality sleep for children. Parents in this age group may have access to more information about sleep hygiene and the importance of creating a sleep-friendly environment for their children.

Parents in their 30 s and 40 s often have more stable financial situations, allow them to provide a comfortable sleeping environment for their children. This can include investing in quality mattresses, bedding etc. These parents are most likely emotionally mature, leading to patience and understanding, leading to calm bedtimes.

Children who slept <7 h, were almost 3 times more likely to have disturbed sleep. According to the National sleep foundation, for children aged 6 to 13 years and 14 to 17 years, the recommended sleep duration is 9–11 h and 8–10 h, respectively. Seven hours of sleep may be appropriate, however, below this is not recommended for both age groups [32]. Short sleep durations in primary school children can cause fragmented sleep, late sleep onset and early raising to prepare for school and other factors leading to a cumulative sleep debt.

5. Limitations of the study

The study relied on information provided by parents or caregivers, which raises the potential for recall bias and decreased accuracy compared to more objective approaches, like actigraphy or polysomnography. To minimize this, we had brief participant education, use of time frames, and prompts. In addition, the SDSC's discriminatory validity, sensitivity, and specificity have not been evaluated because of the lack of standardized tools for comparison.

The parents may underestimate the sleep disorder in their child due to the lack of awareness of some sleep disorder symptoms. We encouraged parents/caregivers to be objective and report what they have observed.

Ethics approval and consent to participate

Ethical approval was provided by the School of Medicine Research and Ethics Committee (SOMREC) Reference number: Mak-SOMREC-2022–435. Administrative approval was sought from the Kampala City Council Association (KCCA), Permission was also sought from the selected school authorities and the respective LC1. Written informed consent was obtained from the caregivers and assent from children aged 8 years and above before enrolment into the study. Children diagnosed with sleep disturbances were advised to seek further evaluation from a pediatrician.

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

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Declaration of competing interest

The authors declare no conflicts of interest.

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