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CC-BY **Quality of sleep in children with chronic illnesses attending the out-patient clinics in Sagamu, Ogun State: A preliminary report**



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Abstract: *Background:* Children with chronic diseases are reported to have poor sleep. Factors inherent in chronic disorders and the pathology of the diseases are some factors known to cause sleep disorders. There is a paucity of data in Nigeria on this abnormality among chronically ill children.

Objective: To assess the quality of sleep in children with chronic diseases attending the Children Out-patient Clinics of Olabisi Onabanjo University Teaching Hospital, Sagamu.

Materials and Methods: A cross-sectional survey of children presenting with various chronic disorders at the Paediatric Speciality Clinics of the Olabisi Onabanjo University Teaching Hospital, Sagamu was done. The caregivers and mothers were interviewed using the Pittsburgh Sleep Quality Index (PSQI) and socio-clinical questionnaires.

Results: One hundred and fifteen children were studied. Sleep

initiation was less than 30 minutes in 86% of the sampled population. Males had a lesser duration of sleep initiation than females. The mean duration of sleep was 9.6(± 1.93) hours. Sleep quality was poor in 15.7% of the study population. Children with renal diseases formed the bulk of those with poor sleep. The sleep disorders reported included frequent night waking (59.1%), snoring (15.6%) and day time sleepiness (10.4%). The extent of the effect of poor quality of sleep on daytime activities was not studied.

Conclusion: Sleep quality is poor among children with chronic diseases. Further large scale, multi-center study is desired to be able to generalize the findings and to determine possible effects of poor sleep quality on academic performance and quality of life.

Keywords: Children, Chronic diseases, Quality of Sleep, Snoring.

Introduction

Sleep is a state of non-arous ability during which the brain becomes gradually unresponsive to visual, auditory stimulations and the environment.¹ The sleep-wake system is thought to be regulated by the interplay of two major processes: one that promotes sleep (Process S) and one that maintains wakefulness (Process C). Process S is the homeostatic drive for sleep. The need for sleep (Process S) accumulates across the day, peaks just before bedtime at night and dissipates throughout the night. Process C is wake-promoting and is regulated by the circadian system. Process C builds across the day, serving to counteract process S and promote wakefulness and alertness. However, this wake-promoting system begins to decline at bedtime, serving to enhance sleep consolidation as the need for sleep dissipates across the night. With an adequate night's rest, the ho-

meostatic drive for sleep is reduced, the circadian waking drive begins to increase, and the cycle starts over.²

Infants typically sleep 14 to 15 hours per day with the majority of sleep consolidated in the evening and during one to two naps during the day.³ Twenty to thirty (30) percent of children in cross-sectional studies have significant bedtime problems or night waking, and in most cases, these have behavioral causes and solutions. Children at different ages have been reported to have difficulties falling asleep and with frequent nighttime waking, though with varying prevalence. There are both intrinsic and extrinsic factors contributing to sleep problems.^{4,7} Sleep problems are among the most common complaints in children with negative consequences.⁸ The consequences of sleep deprivation include decreased release of growth hormone, abnormalities of immune system functions and heart dysfunction.⁹

Children with chronic diseases are at increased risk of sleep problems as reported by several studies; some of these chronic disorders include cerebral palsy,¹⁰ epilepsy,¹¹ asthma¹² and leukaemia¹³, and chronic kidney disease.¹⁴ Children with cerebral palsy have sleep problems with sensory, motor and cognitive features serving as predisposing factors while in epilepsy there is a complex interaction between sleep and epilepsy.^{15,16} A study among normal Swedish children in a western country reported frequent and persistent nighttime awakenings as major complaints.¹⁷ In Nigeria, Ofovwe et al¹⁸ in their study on the prevalence and pattern of sleep disorder among children with neurological diseases reported restlessness in 68.7%, frequent awakening in 66% and snoring in 57.3% of them. A study on children with sickle cell anaemia also reported poor quality and duration of sleep due to symptoms of the disease and enuresis.¹⁹ Another study of normal school children by Senbanjo et al,²⁰ in Lagos Nigeria, reported a reduction in sleep hours as age increased. Some of the reported sleep problems included enuresis, fear of sleeping alone, snoring and sleep walking.²¹

In Nigeria, there is a paucity of data on sleep quality among children with chronic disorders. The reported prevalence rates of chronic diseases are 2%-3% in sickle cell anemia, 1-18% in bronchial asthma and 3.3% in chronic kidney disease.²²⁻²⁴ Much attention is possibly not given to sleep quality by clinicians involved in the care of children with chronic disorders. This study was carried out to assess the quality of sleep among children with chronic diseases in our center as a pilot study.

Materials and Methods

This is a cross-sectional survey of children with chronic diseases attending the Children Out-patient Clinics of the Olabisi Onabanjo University Teaching Hospital, Sagamu in Ogun State of Nigeria. After obtaining ethical clearance from the hospital's Health Research Ethics Committee (OOUTH/HREC/195/2018), informed verbal consent was also obtained from the caregivers and parents while assent was obtained from children aged seven years and above.

Recruitment of children into the study was done at all the Consultants' Specialty Clinics, which run every day of the week. Age less than 16 years and the presence of chronic illness were the inclusion criteria. The definition of chronic illness adopted for this study was any disease lasting for more than three months which requires continuous medication for control.²⁵

The Pittsburgh Sleep Quality Index (PSQI) questionnaire was administered on each of the study subjects with assistance from the caregivers when needed. A Resident doctor in the Department of Paediatrics was trained on the application of the questionnaire by one of the researchers, a Consultant Psychiatrist. The administration of the questionnaire was done by both the resident doctor and the Consultant when feasible. Quality

assurance was ensured by frequent and random checks by the Consultant. The PSQI was used to measure the quality of sleep and the tool had been previously validated in Nigeria.²⁶ There are nineteen items on the questionnaire. These items were computed to generate seven components with different scores allotted. The seven "components" included sleep quality, sleep latency, sleep duration, habitual disturbances, and daytime dysfunction. The sum of the scores for these seven components yielded a global score which ranged from 0 to 21 with a score of 5 being diagnostic of poor sleep. Children with a score of 5 were counseled and referred for further evaluation.

Other information obtained included age, sex, clinical diagnosis, and anthropometry. The duration of sleep was assessed based on the age group. The normal sleep duration in infancy is 9.⁷⁻¹⁵.9hours, 9.⁹⁻¹³.8hours for pre-school age children and 7.⁶⁻¹⁰.8hours for older children.²⁷ Data analysis was done with SPSS version 23.0 using descriptive and inferential statistics. Statistical significance was defined by p values less than 0.05.

Results

A total of 115 children were studied over 3 months. The male to female ratio was 1.2:1 (61 males and 54 females) and the mean age was 6.78 (\pm 4.53) years. Table 1 shows the age grouping of the subjects. The average time of going to bed among the subjects was 8.8(\pm 0.92) pm each night and the mean duration of sleep was 9.6 (\pm 1.96) hours every night. The majority (86.1%) of the subjects initiated sleep within 30 minutes of being in bed. Table 2 shows that males initiated sleep faster than females. The duration of sleep was normal in 38.5% (n=5) infants, 66.7% (n=36) of pre-school aged and 49.3% of older children (Table 3). The problems associated with sleep among the subjects included waking up in the night (36/115; 31.3%), snoring (18/115; 15.6%) and difficulty staying awake during the day (12/115; 10.4%).

Table 1: Distribution of 115 children according to age groups

Age group (years)	Frequency	Percentage
<1	13	11.3
>1-5	39	33.9
>5-15	63	54.8

Table 2: Sleep initiation time and sex

Sleep Initiation	Sex	
	Male	Female
Less than 30 minutes	55 (55.6%)	44 (44.4%)
30-60 minutes	5 (41.7%)	7 (58.3%)
Greater than 60 minutes	2 (50.0%)	2 (50.0%)
Total	62	53

$\chi^2 = 0.924, P = 0.63.$

Table 3: Sleep pattern in relation to age grouping

Age (years)	Normal	Abnormal
<1	5 (21.7%)	18 (78.3%)
1-5	26 (66.7%)	13 (33.3%)
>5-15	36 (67.9%)	17 (32.1%)

*Normal = required hours of sleep, Abnormal= </> Normal($\chi^2 = 5.78, p=0.0003$)

The caregiver sleep quality rating was adjudged very good at 89.6% and fairly good at 10.4%. The quality of sleep was good in 84.3% (n=97) and poor in 15.7% (n=18) children. Poor quality of sleep occurred more frequently among the females. Table 4 shows the initiation of sleep according to the systems affected; irrespective of the systemic illness a large proportion still initiated sleep within 30 minutes of being in bed. A large proportion of subjects with renal and neurologic diseases had poor quality of sleep 9/37(24.3%) and 6/18) (33.3%) as shown in Table 5. Poor sleep was recorded among children with chronic kidney disease [33.3% (n=3)], nephrotic syndrome and nephroblastoma [22.2% (n=2) each]. Children with seizure disorders accounted for 66.7% (n=4) of children with neurologic diseases with poor sleep. Children with neurologic disorders had a significantly poorer quality of sleep compared to others ($X^2 = 5.05, p = 0.025$) while children with renal diseases tended to have a poorer quality of sleep compared to other children ($X^2 = 3.108, p = 0.08$). There was no significant relationship when the proportion of children with cardiac disorders with poor quality of sleep was compared with other children ($X^2 = 0.403, p = 0.526$).

Table 4: Systems affected and time of sleep initiation

Systems affected	Less than 30 minutes	30-60 minutes	More than 60 minutes
Renal	31(88.6%)	2(5.7%)	2(5.7%)
Hematology	29(100%)	0(0%)	0(0%)
Cardiology	12(85.7%)	2(14.3%)	0(0%)
Neurology	12(70.6%)	3(17.6%)	2(11.8%)
Endocrinology	8(72.7%)	2(18.2%)	1(9.1%)
Gastrointestinal	2(100%)	0(0%)	0(0%)
Respiratory	4(51.7%)	2(28.6%)	1(14.3%)
Total	98	11	6

Table 5: Quality of sleep distributed according to the systems affected

Systems affected	Good (%)	Poor (%)	Total
Renal	28 (75.7)	9 (24.3)	37(100%)
Neurology	12 (66.7)	6 (33.3)	18(100%)
Cardiology	11 (78.6)	3 (21.4)	14(100%)
Hematology	28 (100)	0 (0)	28(100%)
Endocrinology	10 (100)	0 (0)	10(100%)
Respiratory	6 (100)	0 (0)	6(100%)
Gastrointestinal	2 (100)	0 (0)	2(100%)
Total	97 (84.3)	18 (15.7)	115

Discussion

The quality of sleep was found to be poor mainly among children with chronic kidney diseases as reported by Stabouli et al who reported that children with chronic

kidney disease had 77-85% prevalence of poor sleep quality unlike the prevalence of 15.7% in the present study. Stabouli et al studied patients who had end-stage kidney disease and on dialysis while the children in the present study were stable non-dialytic cases.¹⁴

The required hours of sleep vary with age; infants require 16-18hours while 11-12hours, 10 hours and 8 hours of sleep were required by the school-aged children, prepubescent children, and children aged 16years respectively.^{21,27,28} In this study about a fifth of the infants had a normal duration of sleep while 66.67% of school-aged children and older children reported a normal duration of sleep. This is considered adequate for the different age groups.^{21,27,28} The average duration of sleep in the subjects will be considered adequate considering that the majority of them belonged to the school-age group where the required duration is 10hours. It was also observed that the duration of sleep reduced with age in agreement with some earlier reports.^{9,10} The findings in the present study showed a longer duration of sleep compared to six to eight hours reported by Chinawa et al, Oluwole et al, and Sanya who studied undergraduate medical students and secondary school students.³⁰⁻³² The difference in findings may be due to differences in the study settings, nature of cohorts and the sampling techniques. The present study was focused on children with chronic illnesses and recall bias may have influenced the responses of caregivers and parents whereas the previous studies were based on self-report.

The sleep initiation time observed in the present study is similar to the report of Maduabuchi et al in Enugu, Nigeria on normal secondary school children. The latter finding suggests that sleep initiation is not dependent on illness but the interplay of complex factors.^{17,33} Behavioural sleep disorders reported among children include difficulty with or requiring help to get to sleep, not getting into bed and frequent waking in the night; these are part of sleep hygiene.³³ Frequent awakening in the night was observed in more than half (59.1%) of the subjects in the present study though lower than 66% reported by Ofovwe in Benin City Nigeria.¹⁸ The difference may probably be due to the nature of the subjects in the present study. This may be attributed to differences in population and environmental factors. The population studied in Benin City was mainly children with neurologic disorders, who may also have other comorbidities.

Snoring and difficulty staying awake during the day were other sleep problems observed in the present study, similar to findings reported by studies of Senbanjo and Ofovwe, both in Nigeria.^{18,20} The prevalence of snoring in this study is more than double the rate reported by Sanya et al due to different study cohorts as the subjects, who were undergraduates, may not have reported snoring because they were not aware of such. Snoring occurring in other diseases apart from respiratory disorders may be because of complex reasons like comorbidities as well as the pathology of the index illness. Also, it is important to note that the findings in the present study were based on recall by caregivers, who themselves may

be too sleepy to observe or recollect the events of the night.

According to the International Classification of Sleep Disorders-3(ICSD-3),insomnia is defined as a repeated difficulty with sleep initiation, duration, consolidation or quality occurring despite adequate opportunity and circumstances for sleep, resulting in some form of daytime impairment.³⁴ Daytime sleepiness was observed in 10.4% of subjects in the present study and this is lower compared to the rates reported among Palestinian and Nigeria children.^{35,36} This relatively low value maybe because both studies were conducted on sleep patterns and not sleep quality, though daytime sleepiness is a component of the total quality of sleep. Also, the study group in those studies comprised well adolescents. Poor quality of sleep was observed in 10.4% of the subjects in the present study but a larger proportion of this was children with renal and neurologic disorders. It is interesting to note that a third of the children with neurologic conditions had poor quality of sleep and these are subjects with seizures. This finding is in agreement with previously documented report on sleep abnormalities in such children.^{11,18,20} Kidney dysfunction is associated with various imbalance of electrolytes and metabolites such as potassium and urea, which might be responsible for sleep disorders in this group of children.^{37,38}

There is an accumulation of fluid in kidney diseases, though of varying degrees, hence patients with kidney diseases may have rostral overnight fluid shift.³⁹ This may explain why more children with kidney diseases in the present study were observed to have poor sleep. Kidney disorders have been reported to be associated with various sleep disorders including restless leg syndrome (RLS) and obstructive sleep apnea.^{37-38,40} An interesting

observation in the study subjects is that the prevalence of poor quality of sleep determined subjectively is akin to the prevalence obtained through a qualitative assessment of sleep quality; (10.4% versus 15.7%). This shows that the caregivers could accurately assess the quality of sleep among their wards. The implication of this is that clinicians need to pay close attention and specifically ask about sleep problems when attending to chronically ill children as this may have a far-reaching effect on their academic and quality of life.

A limitation to our study findings is that the results obtained used self –reporting questionnaires among the care-givers and mothers and this may be affected by recall bias.

Conclusion

Quality of sleep is poor among children with chronic diseases attending Out-patient Clinics and it is associated with different sleep behaviours. We will, therefore, recommend a multi-center study for generalization of findings and to assess the effects of the quality of sleep on school performances and quality of life.

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