SCIENTIFIC CORRESPONDENCE

Myopia and night lighting in children in Singapore

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Abstract

***Aim*—To examine the role of night time lighting and myopia in children in Singapore**

***Methods*—A cross sectional study was conducted on 1001 children in two Singapore schools. Cycloplegic refraction and A-scan biometry measurements were made in both eyes. A detailed questionnaire was completed by the parents to obtain information on night time lighting, near work activity, educational and demographic factors.**

***Results*—There was no difference in myopia prevalence rates in children exposed to night time light (33.1%) compared with children who slept in the dark (31.4%) before age 2. In addition, vitreous chamber depth was not related to night light (p=0.58) before age 2. These results remained even after controlling for near work.**

***Conclusion*—Myopia is not associated with night light in Asian populations.**

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Visual input in early life may be important in refractive development. This includes the periodicity of light/dark cycles. In studies in chicks, eyes exposed to continuous light became enlarged and had abnormal refractions.[1 2] Recently, three short articles published in *Nature* have reported contradictory evidence on the role of night time lighting in the development of myopia in predominantly white populations.[3–5] Quinn *et al* found a strong association between myopia and night time lighting (p<0.00001), but Zadnik *et al* and Gwaizda *et al* found no association.[3–5] Myopia is an important public health problem in several Asian countries, and it has been suggested that the relation between ambient lighting at night and myopia be examined in Asian populations because of their higher prevalence.[6 7] We performed a cross sectional study of refractive errors in 1001 Asian schoolchildren in Singapore, in which we examined the role of night time lighting.

Materials and methods

All children in grades one to two in the Eastern school and grades one to three in the Northern school in Singapore were invited to participate in a cohort study. The initial cross sectional results of the cohort are presented here. Children aged 7–9 years were examined in November 1999: 49.8% were boys; 72.7% Chinese, 19.3% Malays, 5.6% Indians, and 2.4% from mixed ethnic groups. Study approval was obtained from the ethics committee, Singapore Eye Research Institute and informed written consent was obtained from the parents. Corrected and uncorrected distance visual acuity was measured using logMAR charts following a standard protocol. Cycloplegia was administered with three drops of 1% cyclopentolate instilled 5 minutes apart. Thirty minutes after the last drop, autorefraction was performed using the Canon RK5 autorefractometer (Canon Inc Ltd, Tochigiken, Japan) and A-scan echography using the Nidek Echoscan model US-800 biometry machine (Nidek Co Ltd, Tokyo, Japan).

The parents completed a self administered eight page questionnaire on their children's night light conditions before 1 year, before 2 years, at around 2 years of age, 4 years, and in the past year. We asked whether the child slept at night in darkness, light from the adjacent room or window, night light or "dim" light, or room light. In addition, information on socioeconomic status, near work activity such as the number of books read per week, and parental history of myopia were obtained.

DATA ANALYSIS

The χ^2 test was used to compare the proportion of myopic children for different night lighting environments. The Kruskall-Wallis test was used to compare the vitreous chamber depth between different categories of night lighting conditions. In multiple logistic regression models with the response variable as myopia (yes or no), the effects of night lighting conditions were assessed, adjusting for other confounders. In multiple linear regression models, the effect of the main covariate, night lighting on the different biometry measures (axial length, vitreous chamber depth, lens thickness, and anterior chamber depth) were assessed.

Results

The initial cross sectional results revealed that 32.4% of the children had myopia (defined as spherical equivalent at least −0.50 dioptres). The average eyeball length was 23.3 mm, average vitreous chamber depth was 16.2 mm, and average anterior chamber depth was 3.7 mm.

Table 1 Myopia prevalence rates and vitreous chamber depth in relation to night lighting conditions before 2 years and before 1 year of age in Singapore schoolchildren

	% Myopic (95% CI)	Mean vitreous chamber depth (mm) (95% CI)
Lighting conditions while sleeping before 2 years		
In the dark	31.4 (26.7, 36.0)	16.2 (14.8, 19.1)
Light from adjacent room or window	36.3 (29.4, 43.2)	16.3 (14.9, 18.8)
Night light or "dim" light	33.2 (28.0, 38.4)	16.2 (15.0, 19.1)
Room light	29.9 (20.1, 39.7)	16.3 (14.8, 18.4)
Lighting conditions while sleeping before 1 year		
In the dark	32.9 (27.9, 37.8)	16.1 (14.5, 19.3)
Light from adjacent room or window	34.4 (27.6, 41.2)	16.2 (14.4, 19.0)
Night light or "dim" light	32.2 (27.5, 36.9)	16.1 (14.3, 19.1)
Room light	31.8 (20.3, 43.4)	16.4 (14.5, 19.6)

Myopic children had an average vitreous chamber depth of 16.9 mm compared with 15.9 mm in non-myopic children (p<0.001). In all, 39.5% of the children slept in the dark, 19.3% slept with light from the adjacent room or window, 32.4% slept in night light or "dim" light, and 8.8% slept in room light before age 2.

There was no association between myopia and night time lighting conditions before 1 year (p = 0.96), before 2 years (p = 0.62), around 2 years of age (p = 0.30), 4 years (p = 0.56), or in the past year (p = 0.57) (Table 1). In multiple logistic regression analysis, the relation between myopia and night light remained the same, after controlling for age, sex, race, near work activity, parental history of myopia, and type of school. There was no statistically significant interaction effect of night time lighting and near work on myopia. Additionally, there was no relation between vitreous chamber depth and lighting at night before 1 year (p = 0.48), before 2 years (p = 0.58), at around 2 years of age (p = 0.38), 4 years (p = 0.32), or in the past year (p = 0.74). Similarly, axial length and anterior chamber depth were not related to night time lighting. In multiple linear regression models, the relation of the different biometry measures was not associated with night time lighting, after controlling for the other confounders. There was, however, a positive association between myopia and near work, parental myopia, and total family income.

Discussion

There appears to be an increase in myopia prevalence in Asian countries such as Singapore, Hong Kong, Taiwan, and Japan.[6 7] The hypothesised environmental risk factors include near work and, recently, night light exposure in childhood. In this epidemiological study, there was no association between myopia and night light. Our study has several strengths: comprehensive near work assessments were combined with both refractive error and biometry measures. Furthermore, information on possible confounders such as near work activity was collected.

Our negative findings in an Asian population concur with several other reports in white populations, which strongly indicate that the non-association with night lighting may be a universal effect across different ethnic groups.[4 5 8–10] It is unlikely that the rapid rise in myopia prevalence in Singapore over the past few decades may be due primarily to changes in night light patterns. Another explanation is that quantitative assessments of recalled night activity by parents may not be accurate, and there may be other better measures such as diaries or the placements of light meters in the child's room.

Eyeball length was not different for children who slept with night lighting, lending further evidence that night light may not be related to myopia. Our results are in agreement with the negative findings of Zadnik *et al* and Gwiazda *et al*.[4 5] It is possible that other aetiological factors such as parental myopia or near work may result in a spurious positive association between myopia and night lighting. Our community sample has comparable age ranges and a similar high prevalence of myopia as the study by Quinn *et al*, yet no positive relation was found.[3] In addition, we controlled for potential confounders such as parental myopia and near work activity. Children in Singapore spend a large amount of time on near work.[11] In contrast, only 32.4% of children in Singapore sleep with night lights, compared with 48.4% in the study by Quinn *et al*. Another possibility is that the effects of night time light on myopia may be obscured by other factors such as near work. In conclusion, night lighting appears not to be associated with the development of myopia among Singaporean children. In Singapore, we stress to parents that they need not be overconcerned about night lighting in relation to the possible development of myopia.

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