

# Changes of the ocular refraction among freshmen in National Taiwan University between 1988 and 2005

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## Abstract

**Purpose** The prevalence of myopia in Taiwan has been reported to be increasing in the sequential nationwide survey. The purpose of this study is to compare the change of ocular refraction among freshmen in 1988 and 2005 in National Taiwan University.

**Methods** The refractive status of freshmen in National Taiwan University in 2005 was examined. The refractive status and corneal radius of each student were measured with autorefractometer. The data was compared with the data obtained in 1988. All the refractions of the right eye were chosen and myopia was defined as a mean spherical equivalent of  $-0.25$  D or more.

**Results** The mean refractive status of total 4686 freshmen was  $-4.25 \pm 2.74$  D in 1988 ( $-4.12 \pm 2.72$  D for males and  $-4.41 \pm 2.75$  D for females). The prevalence of myopia was 91.3% (90.1% for males and 92.8% for females). The prevalence of high myopia (over  $-6.0$  D) was 23.5% (22.2% for males and 25.1% for females). In 2005, the mean refractive status of total 3709 freshmen was  $-4.93 \pm 2.82$  D ( $-4.93 \pm 2.83$  D for males and  $-4.93 \pm 2.80$  D for females). The prevalence of myopia was 95.9% (95.9% for males and 95.9% for females). The prevalence of high myopia was 38.4% (38.1% for males and 38.8% for females).

**Conclusions** The prevalence and severity of myopia in freshmen of National Taiwan University increased significantly in 2005 compared to 1988. The distribution of refractive status in different college changed also. These findings may be explained by the early onset of myopia.

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**Keywords:** myopia; ocular refraction; freshmen

Taiwan is one of the countries with high prevalence of myopia.<sup>1</sup> The purpose of this study is to compare the change of ocular refraction among freshmen between 1988 and 2005 in National Taiwan University.<sup>2</sup>

The mean refractive status of total 4686 freshmen was  $-4.25 \pm 2.74$  D in 1988 ( $-4.12 \pm 2.72$  D for male and  $-4.41 \pm 2.75$  D for female). In 2005, it was  $-4.93 \pm 2.82$  D ( $-4.93 \pm 2.83$  D for male and  $-4.93 \pm 2.80$  D for female) of total 3709 freshmen. The result was shown in the Table 1. The prevalence of myopia was 95.9% in 2005, while it was 91.3% in 1988. The prevalence of high myopia (over  $-6.0$  D) increased to 38.4% (38.1% for male and 38.8% for female) in 2005, while it was 23.5% (22.2% for male and 25.1% for female) in 1988. The distribution curve in 2005 compared to 1988 was obviously more myopic-shifted. Detail analysis of refractive status among male and female freshmen in 1988 and 2005 was showed in Table 2. There was a significant difference between 1988 and 2005 ( $\chi^2$  test,  $P < 0.0001$ ). The incidence of both low myopia ( $-0.25$  to  $-3.0$  D) and moderate myopia ( $-3.0$  D to  $-6.0$  D) decreased around 5%. However, the high myopic rate ( $< -6.0$  D) was increased more than 10%. There was a significant increase in high myopia. (Fisher's exact test,  $P < 0.05$ ). Besides, if we defined pathological myopia according to Tokoro's classification,<sup>3</sup> the rate of pathological myopia ( $< -8.0$  D) in female and male in 2005 was 15.0 and 10.6%, respectively.

The results of our studies demonstrated that the prevalence of myopia, especially high myopia increased among the freshmen in National Taiwan University. These findings may be explained by two possible reasons. First, we found the age of onset of myopia decreased from 12 years in 1983 to 8 years in 2000 in our previous nationwide survey.<sup>1</sup> Second, myopia is influenced

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**Table 1** The prevalence of myopia and high myopia

		Male	Female	Total
1988	Prevalence of myopia	90.1% (2373/2634)	92.8% (1904/2052)	91.3% (4277/4686)
	High myopia	22.2%	25.1%	23.5%
	Refractive error	$-4.12 \pm 2.72$ D ( $n = 2634$ )	$-4.41 \pm 2.75$ D ( $n = 2052$ )	$-4.25 \pm 2.74$ D ( $n = 4686$ )
2005	Prevalence of myopia	95.9% (1973/2057)	95.9% (1585/1652)	95.9% (3558/3709)
	High myopia	38.1%	38.8%	38.4%
	Refractive error	$-4.93 \pm 2.83$ D ( $n = 2057$ )	$-4.93 \pm 2.80$ D ( $n = 1652$ )	$-4.93 \pm 2.82$ D ( $n = 3709$ )

**Table 2** The distribution of refractive status in 1988 and 2005

		Hyperopia		Emmetropia	Myopia			
		$> +2.0$ D	$+2.0 \sim +0.26$ D	$+0.25 \sim -0.25$ D	$-0.25 \sim -3$ D	$-3 \sim -6$ D	$-6.0 \sim -10.0$ D	$< -10.0$ D
1988								
Male (2634)	9 (0.3%)	83 (3.2%)	108 (4.1%)	724 (27.5%)	1124 (42.7%)	546 (20.7%)	40 (1.5%)	
Female (2052)	21 (1.0%)	46 (2.2%)	66 (3.2%)	491 (23.9%)	911 (44.4%)	472 (23.0%)	45 (2.2%)	
Total (4686)	30 (0.6%)	129 (2.8%)	174 (3.7%)	1215 (25.9%)	2035 (43.4%)	1018 (21.7%)	85 (1.8%)	
2005								
Male (2057)	9 (0.4%)	20 (0.9%)	55 (2.6%)	418 (20.3%)	803 (39.0%)	667 (32.4%)	85 (4.1%)	
Female (1652)	1 (0.06%)	25 (1.5%)	41 (2.5%)	319 (19.3%)	651 (39.4%)	541 (32.7%)	74 (4.5%)	
Total (3709)	10 (0.3%)	45 (1.2%)	96 (2.6%)	737 (19.9%)	1454 (39.2%)	1208 (32.6%)	159 (4.3%)	

not only by genetic factors but also environmental factors. Environmental factors may play important role in the development or progression of myopia.<sup>4,5</sup> This high-prevalence rate of high myopia and its complications strike us to make more close observation in this high educational group.

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