Analysis of Eye Health in the Thai Population

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Objective: *To assess national eye health as a baseline for improving medical education, services and research.*
Material and Method: *Information on eye illness among out- and in-patients was based on hospital claims from the three national health insurance schemes in 2010. The data were analyzed by age groups.*
Results: *In 2010, 4,982,025 out-patient visits and 187,080 in-patient admissions were reported. The five most common out-patient eye conditions were disorders of the (1) conjunctiva (H10-H13) (2) eyelid, lacrimal system and orbit (H00-H06) (3) lens (H25-28) (4) sclera, cornea, iris and ciliary body (H15-H22) and (5) glaucoma (H40-H42). The five most common in-patient eye diseases were (1) disorders of lens (H25-H28) (2) conjunctiva (H10-H13) (3) sclera, cornea, iris and ciliary body (H15-H22) (4) choroid and retina (H30-H35) and (5) glaucoma (H40-H42).*
Conclusion: *Information on the most frequent eye diseases-including the types and frequency of high risk conditions, the diseases causing the most impact on vision and resulting in the highest health expenditures-will be used to (a) revise the curricula for medical education (b) to improve eye care services and (c) to improve access to data for research themes tailored to local and national needs.*

Keywords: *Eye health, Burden of diseases, Medical curricula, Medical personnel*

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Over the past 15 years, developments in science and technology have resulted in numerous innovations in ophthalmology. Cataract surgery, for example, has rapidly evolved from intracapsular extraction to extracapsular extraction and phacoemulsification. Post-operative visual rehabilita-tion has also shifted from spectacles and contact lens to intraocular lenses[1]. Medical personnel needed to undergo training to improve their knowledge and skill vis-a-vis this new information, these techniques and devices. Undoubtedly, these innovations have improved eye care services and quality of life for the Thai population. The implementation of the Universal Healthcare Coverage (UC) scheme by the National Health Security Office (NHSO) has also improved accessibility to healthcare a heretofore poorly served large segment of the population. These factors combined have resulted in an overload of demand for service and a shortage of ophthalmologists in the public healthcare sector[2]. Since the mission of the Faculties of Medicine and the Health Science Consortia of Thailand is to produce medical personnel, adjustments to the medical curricula will be needed to satisfy the demand for personnel and in order to appropriately respond and treat the common eye diseases in the nation. This information can be obtained by studying the present context of the eye care services to the Thai population.

At present, there are three public health insurance schemes in Thailand, providing coverage to more than 96% of the population: (1) the Social Security Scheme (SS) covers workers in the employment sector, (2) the Civil Servant Medical Benefits Scheme (CSMB) covers government employees and their dependents, while (3) the remaining population is covered by the abovementioned UC Scheme. The objective of the present study was to analyze the data on eye care services in Thailand in the fiscal year 2010 by using information from these three schemes. The results are to be used as a baseline for improving the ophthalmologic curricula in medical schools as well as eye care service provision across the nation.

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Material and Method

Data were from the Medical Expense Forms of both in- and out-patients in the fiscal year 2010 (October 1, 2009 and September 30, 2010). The National Health Security Office (NHSO) and the Social Security Office

(SSO), Thailand, provided access. In addition, in-patient data from the Civil Servants Benefit System was obtained from the Comptroller General's Department.

Accuracy of the data was confirmed by checking for and correcting or censoring: (a) overlapping or repeated information; (b) visiting dates; (c) missing items; (d) incorrect coding; and (e) the correct fiscal year. The basic statistical analysis of variables was calculated using SPSS for Windows. After analyzing the data, the research team checked the face validity. The data were then assessed by the following age group subclasses: pre-school and school-age (0-18 years), working age (19-59 years) and the elderly (60+ years).

Results

In the fiscal year 2010, the UC and SS schemes recorded 4,982,025 OPD visits, while the UC, SS and CSMB schemes recorded 187,080 in-patient admissions. The five most frequent out-patient eye conditions in order of decreasing frequency were disorders of the (1) conjunctiva (H10-H13) (2) eyelid, lacrimal system and orbit (H00-H06) (3) lens (H25-28) (4) sclera, cornea, iris and ciliary body (H15-H22) and (5) glaucoma (H40-H42) (Table 1). The five most common in-patient eye diseases in order of decreasing frequency were disorders of (1) lens (H25-H28) (2) conjunctiva (H10-H13) (3) sclera, cornea, iris and ciliary body (H15-H22) (4) choroid and retina (H30-H35) and (5) glaucoma (H40-H42) (Table 2).

Out-Patients (OPD)

The authors analyzed the frequency of out-patients by age group in order to assess the main problems and dimensions of the diseases for each stage of life (Fig. 1). The posterior segment eye diseases (*viz.*, H30-H36 Disorders of choroid and retina, H43-H45 Disorders of vitreous body and globe, H46-H48 Disorders of optic nerve and visual pathway) accounted for 5.43% of total out-patient visits (270,542/4,982,025). Among the pre-school and school-age group, the most common eye diseases were disorders of the (1) conjunctiva (47.3%) (2) eyelid, lacrimal system and orbit (23.0%) and (3) sclera, cornea, iris and ciliary body (17.6%). Among the working age group, the most frequent eye conditions were disorders of the (1) conjunctiva (47.5%) (2) eyelid, lacrimal system and orbit (14.8%) and (3) sclera, cornea, iris and ciliary body (13.4%). In the elderly age group, the most common eye diseases were disorders of (1) the lens (34.2%) (2) the conjunctiva (24.8%) and (3) glaucoma (12.0%).

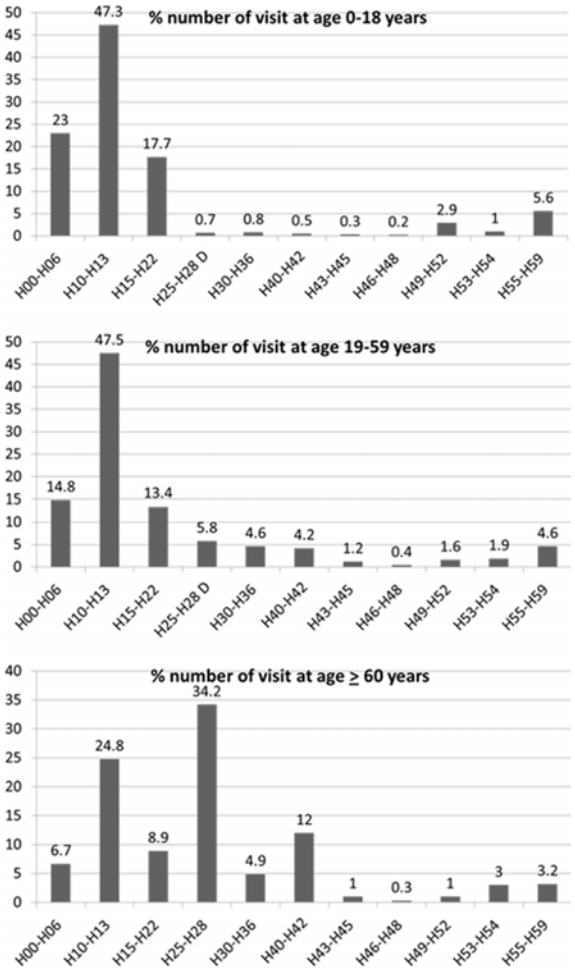

Fig. 1 Most common out-patient eye diseases among the pre-school and school-age (upper), working-age (middle) and elderly groups (lower)

Based on information from the pre-school and school-age group, the top five eye diseases leading to an OPD visit were (1) conjunctivitis (2) hordeolum and chalazion (3) disorders of the sclera (4) other disorders of the eye and adnexa and (5) disorders of refraction and strabismus. Out-patients among the working-age group attended OPD because of (1) conjunctivitis (2) other disorders of the conjunctiva (3) disorders of the sclera (4) disorders of the lens and (5) glaucoma. Among the elderly group, top five eye illnesses leading to an OPD visit were (1) senile cataract (2) disorders of the conjunctiva (3) glaucoma (4) disorders of the sclera and other disorders of the eyelid and (5) the lacrimal system and orbit.

In-Patients (IPD)

There were 187,080 in-patient admissions:

Table 1. Number of out-patient visits by primary diagnosis and age group

No.	ICD-10	0-18 years n = 799,746 (16.0%)	19-59 years n = 2,753,570 (55.3%)	≥ 60 years n = 1,428,709 (28.7%)	Total n = 4,982,025 (100%)
1	H10-H13 Disorders of conjunctiva	378,368 (47.3%)	1,307,744 (47.5%)	353,693 (24.8%)	2,039,805 (41.0%)
2	H00-H06 Disorders of eyelid, lacrimal system and orbit	183,921 (23.0%)	406,456 (14.8%)	96,253 (6.7%)	686,630 (13.8%)
3	H25-H28 Disorders of lens	5,588 (0.7%)	160,856 (5.8%)	487,908 (34.2%)	654,352 (13.1%)
4	H15-H22 Disorders of sclera, cornea, iris and ciliary body	141,144 (17.6%)	368,926 (13.4%)	127,610 (8.9%)	637,680 (12.8%)
5	H40-H42 Glaucoma	4,209 (0.5%)	114,408 (4.2%)	172,179 (12.0%)	290,796 (5.8%)
6	H55-H59 Other disorders of eye and adnexa	44,525 (5.6%)	126,888 (4.6%)	46,001 (4.9%)	217,414 (4.4%)
7	H30-H36 Disorders of choroid and retina	6,456 (0.8%)	126,632 (4.6%)	70,258 (3.2%)	203,346 (4.1%)
8	H53-H54 Visual disturbances and blindness	8,071 (1.0%)	52,731 (1.9%)	42,980 (3.0%)	103,782 (2.1%)
9	H49-H52 Disorders of ocular muscles	23,314 (2.9%)	44,131 (1.6%)	13,579 (1.0%)	81,024 (1.6%)
10	H43-H45 Disorders of vitreous body and globe	2,757 (0.4%)	34,197 (1.2%)	14,634 (1.0%)	51,588 (1.0%)
11	H46-H48 Disorders of optic nerve and visual pathways	1,393 (0.2%)	10,601 (0.4%)	3,614 (0.3%)	15,608 (0.3%)

Table 2. Number of admissions by primary diagnosis and age group

No.	ICD-10	0-18 years n = 5,370 (2.9%)	19-59 years n = 48,280 (25.8%)	≥ 60 years n = 133,430 (71.3%)	Total n = 187,080 (100%)
1	H25-H28 Disorders of lens	488 (9.1%)	29,034 (60.1%)	117,472 (88.0%)	146,994 (78.6%)
2	H10-H13 Disorders of conjunctiva	467 (8.7%)	4,012 (8.3%)	3,203 (2.4%)	7,682 (4.1%)
3	H15-H22 Disorders of sclera, cornea, iris and ciliary body	703 (13.1%)	3,981 (8.2%)	2,467 (1.9%)	7,151 (3.8%)
4	H30-H36 Disorders of choroid and retina	514 (9.6%)	3,793 (7.9%)	2,388 (1.8%)	6,695 (3.6%)
5	H40-H42 Glaucoma	84 (1.6%)	2,320 (4.8%)	4,131 (3.1%)	6,535 (3.5%)
6	H00-H06 Disorders of eyelid, lacrimal system and orbit	1,966 (36.6%)	2,159 (4.5%)	1,975 (1.5%)	6,100 (3.3%)
7	H43-H45 Disorders of vitreous body and globe	137 (2.5%)	1,362 (2.8%)	1,191 (0.9%)	2,690 (1.4%)
8	H49-H52 Disorders of ocular muscles	836 (15.6%)	585 (1.2%)	149 (0.1%)	1,570 (0.8%)
9	H46-H48 Disorders of optic nerve and visual pathways	71 (1.3%)	620 (1.3%)	139 (0.1%)	830 (0.5%)
10	H55-H59 Other disorders of eye and adnexa	61 (1.1%)	184 (0.4%)	194 (0.1%)	439 (0.2%)
11	H53-H54 Visual disturbances and blindness	43 (0.8%)	230 (0.5%)	121 (0.1%)	394 (0.2%)

25,567 (13.7%) at primary care hospitals, 52,302 (28%) at secondary care hospitals, 76,120 (40.7%) at tertiary care hospitals and 33,091 (17.7%) at private hospitals. Most in-patient admissions were in the UC scheme (138,042 admissions, 73.8%), followed by the CSMB scheme (41,507 admission, 22.2%), then the SS scheme (7,531 admissions, 4.0%).

Posterior segment eye diseases accounted for 5.46% of total admissions (10,215/187,080). In-patients were also categorized by age group in order to estimate the burden of diseases (Fig. 2). Among the pre-school and school-age group, the most frequent eye disease was of (1) the eyelid, lacrimal system and orbit (36.6%) (2) disorders of the ocular muscles (15.6%) and (3) disorders of the sclera, cornea, iris and ciliary body (13.1%). Among the working-age group, the most common eye diseases were (1) disorders of the lens (60.1%) (2) disorders of the conjunctiva (8.3%) and (3) disorders of the sclera, cornea, iris and ciliary body (8.2%). The predominate eye diseases among the elderly group were (1) disorders of lens (88.0%) (2) glaucoma (3.1%) and (3) disorders of conjunctiva (2.4%).

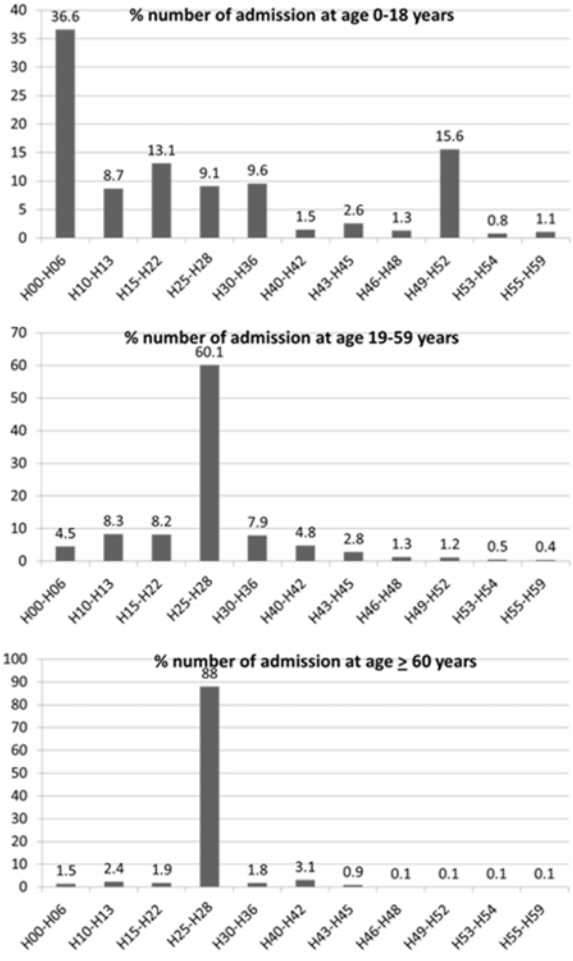

Fig. 2 Most common in-patient eye diseases among the pre-school and school-age (upper), working-age (middle) and elderly groups (lower)

Among the pre-school and school-age group, hordeolum and chalazion persist as the leading cause of admissions, followed by strabismus, disorders of sclera, other retinal disorders and juvenile cataract. In the working-age group, disorder of the lens was the major cause of admission followed by conjunctivitis, keratitis, retinal detachment and breaks and glaucoma. The leading cause of hospital admission among the elderly group was cataract, followed by glaucoma, other disorders of the conjunctiva, keratitis and retinal detachment and breaks. Cataracts and their management will be analyzed and presented in a subsequent paper.

Health expenditures

Hospital charges (in Thai baht) sent for reimbursement were used to represent health expenditures for each disease. The leading eye health expenditure for all age groups is presented in Table 3.

Length of hospital stay

Avoiding hospital admission means having hospital beds available for critically ill persons; therefore, length of hospital stay reflects to a degree the efficacy of national health expenditures. The authors analyzed the top lengths of hospital stay in all age groups (Table 4).

Discussion

The present study aimed to analyze the eye health of Thais and to use all available information for revisions to the medical curricula as well as for the improvement of the eye care service provision system. A very significant observation from the present study was that although posterior segment eye diseases accounted for only 5% of total eye illness, they represented the major cause of visual impairment requiring high health expenditures (Table 3).

The three most common out-patient eye diseases in the pre-school and school-age group were similar to those in the working-age group, including (in order of decreasing frequency) diseases of the conjunctiva, eye lid, lacrimal system and orbit and sclera, cornea, iris and ciliary body. Those in the elderly group

Table 3. Hospital charges (baht) by primary diagnosis of the top 20 eye diseases

	Total		
	Count	Sum (baht)	Mean (baht)
H33 Retinal detachments and breaks	4,261	124,773,306	29,283
H35 Other retinal disorders	2,107	51,176,709	24,289
H43 Disorders of vitreous body	1,248	28,606,114	22,922
H44 Disorders of globe	1,442	31,991,280	22,185
H46 Optic neuritis	676	13,632,956	20,167
H27 Other disorders of lens	2,194	41,828,209	19,065
H25 Senile cataract	140,618	2,605,243,282	18,527
H18 Other disorders of cornea	500	8,844,389	17,689
H26 Other cataract	4,182	71,747,548	17,156
H49 Paralytic strabismus	359	5,098,618	14,202
H16 Keratitis	5,472	68,367,212	12,494
H50 Other strabismus	1,093	13,000,585	11,894
H40 Glaucoma	6,535	77,658,260	11,883
H04 Disorders of lacrimal system	1,812	20,993,798	11,586
H02 Other disorders of eyelid	1,042	10,831,497	10,395
H05 Disorders of orbit	1,892	17,435,499	9,215
H20 Iridocyclitis	582	4,839,424	8,315
H11 Other disorders of conjunctiva	6,163	38,982,038	6,325
H00 Hordeolum and chalazion	1,170	5,941,498	5,078
H10 Conjunctivitis	1,519	4,357,039	2,868

Table 4. Length of hospital stay (days) by primary diagnosis of top 20 eye diseases

	Total		
	Count	Sum	Mean
H16 Keratitis	5,472	53,320	9.74
H44 Disorders of globe	1,442	11,687	8.10
H18 Other disorders of cornea	500	2,953	5.91
H20 Iridocyclitis	582	2,810	4.83
H46 Optic neuritis	676	3,141	4.65
H05 Disorders of orbit	1,892	8,355	4.42
H33 Retinal detachments and breaks	4,261	18,009	4.23
H49 Paralytic strabismus	359	1,491	4.15
H40 Glaucoma	6,535	26,814	4.10
H35 Other retinal disorders	2,107	7,604	3.61
H43 Disorders of vitreous body	1,248	4,177	3.35
H04 Disorders of lacrimal system	1,812	5,950	3.28
H27 Other disorders of lens	2,194	6,860	3.13
H10 Conjunctivitis	1,519	4,698	3.09
H00 Hordeolum and chalazion	1,170	3,352	2.86
H02 Other disorders of eyelid	1,042	2,958	2.84
H26 Other cataract	4,182	11,455	2.74
H25 Senile cataract	140,618	331,099	2.35
H50 Other strabismus	1,093	2,502	2.29
H11 Other disorders of conjunctiva	6,163	10,850	1.76

were age-related including (in order of decreasing frequency) disorders of the lens, conjunctiva and glaucoma.

The three most common in-patient eye diseases across the three age groups were different. The most common eye condition among the pre-school and school-age group was eye lid, lacrimal system and orbit whereas among the working- and senile age groups it was disorders of the lens. Among the pre-school and school-age group, disorders of the ocular muscles and refractive errors were prominent. By contrast, disorders of the lens and glaucoma predominated among the elderly group. These findings agree with previous studies[3,4]. It was duly noted that cataract and disorders of the lens were the major eye diseases among the elderly and that cataract surgery is the most frequently reimbursed operation in persons over 60. More than 100,000 surgeries per year are performed to restore visual function to older Thais; this reflects Thailand's increased life expectancy. The country now faces an increasing burden of eye diseases among the elderly.

At present, cataract surgery in Thailand is highly cost-effective. The per eye health expenditure of 18,527 baht (Table 3) and mean length of hospital stay of 2.35 days (Table 4) did not include cataract surgery done on an out-patient basis as is operated in the majority of hospitals. Day surgery, as it is known, contributes to a lower cost due to no length of stay which is ostensibly unnecessary owing to the proven high clinical effectiveness of the surgery. In addition, manual small incision cataract surgery, as is performed in some hospitals, further reduces the cost and is regarded as the most cost-effective intervention. This finding agrees well with cost-effective cataract surgery reported elsewhere[5-8].

It is also noted from Table 4 that keratitis had the longest average length of hospital stay. Although the cost of medical treatment for keratitis is generally lower than that of eye surgeries, this longer length of hospital stay and the increasing use of newer and more expensive antibiotics resulted in increased health expenditures for this disease.

Since the development and implementation of the public health insurance schemes, the populace can now readily access eye care services. This has resulted in a task overload and a shortage of ophthalmologists in the public sector, particularly in the already underserved rural areas. Ophthalmic nurse practitioners and tele-ophthalmology or internet-based eye care services may have a marked impact on the need for remote eye care delivery[9]. As ophthalmology has traditionally been a medical specialty with substantial private sector involvement in service provision, public-private partnerships could be a feasible policy tool for addressing these problems[10].

Limitations

There are some limitations in the present study. The authors could not retrieve the out-patient data from the CSMB Scheme; therefore, the authors only have data for out-patient visits from the UC and SS schemes. Notwithstanding, the authors had in-patient data from all three public health insurance schemes, which provide coverage for over 96% of the population. This information does, therefore, reflect a relatively complete picture of eye illness among the Thai population.

In addition to the incomplete information on out-patients visits from the CSMB scheme, some errors may have occurred during the original data collection. The reliability and validity of the results therefore depend on the assumption of correct medical diagnosis and coding. In this vein, each of the public health insurance schemes did conduct audits of both the OPD and IPD records from every hospital and found a 10% to 20% error in diagnostics and coding. To improve the correctness of the data, the authors team attempted to correct or censor known inconsistencies.

Conclusion

In conclusion, the authors analyzed the eye health situation of the Thai population for the fiscal year 2010. The information gleaned on (a) frequent eye diseases and (b) high risk conditions treated in OPDs and IPDs through the Kingdom indicate the diseases that are having the greatest impact on vision and expenditures for eye health. These data now need to be considered in the preparation of medical curricula so that medical personnel in training gain the most relevant knowledge and skills for the management of these important eye diseases and that Thailand can meet the ultimate goal of better eye health for all. The information from the present study could also serve as a baseline for improving the delivery of eye care services and planning appropriate research.

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Potential conflicts of interest

None.

References

1. Stark WJ, Sommer A, Smith RE. Changing trends in intraocular lens implantation. Arch Ophthalmol 1989; 107: 1441-4.
2. Yospaiboon Y. Distribution of ophthalmologists in Thailand. Thai J Public Health Ophthalmol 2003; 17: 1-7.
3. Wongwetsawat S. Epidemiology of blindness and low vision in Thailand. Thai J Public Health Ophthalmol 2003; 17: 39-45.
4. Kocur I, Kuchynka P. Eye health care in the Czech Republic. Ophthalmologica 2002; 216: 129-32.
5. Hiratsuka Y, Yamada M, Murakami A, Okada AA, Yamashita H, Ohashi Y, et al. Cost-effectiveness of cataract surgery in Japan. Jpn J Ophthalmol 2011; 55: 333-42.
6. Khanna R, Pujari S, Sangwan V. Cataract surgery in developing countries. Curr Opin Ophthalmol 2011; 22: 10-4.
7. Lansingh VC, Carter MJ, Martens M. Global cost-effectiveness of cataract surgery. Ophthalmology 2007; 114: 1670-8.
8. Kuper H, Jofre-Bonet M, Gilbert C. Economic evaluation for ophthalmologists. Ophthalmic Epidemiol 2006; 13: 393-401.
9. Kumar S, Yogesan K, Hudson B, Tay-Kearney ML, Constable IJ. Emergency eye care in rural Australia: role of internet. Eye (Lond) 2006; 20: 1342-4.
10. Tynkkynen LK, Lehto J. An analysis of ophthalmology services in Finland - has the time come for a Public-Private Partnership? Health Res Policy Syst 2009; 7: 24.

การวิเคราะห์สุขภาพตาของประชากรไทย

ยศอนันต์ ยศไพบูลย์, เกษม ยศไพบูลย์, ธนภัทร รัตนภากร, สุธาสินี สีนะวัฒน์, ธรรศ สงวนศักดิ์, ชวกิจ ภูมิบุญชู

วัตถุประสงค์*: วิเคราะห์ข้อมูลการให้บริการสุขภาพตาของประชากรไทยเพื่อใช้เป็นข้อมูลในการปรับปรุงการเรียนการสอน การให้บริการด้านสุขภาพและเป็นข้อมูลพื้นฐานของการวิจัย*

วัสดุและวิธีการ*: ศึกษาข้อมูลการเจ็บป่วยทั้งของผู้ป่วยนอก และผู้ป่วยในในโรงพยาบาล โดยใช้ข้อมูลที่โรงพยาบาลส่งเบิกจ่ายจากระบบประกันสุขภาพทั้ง 3 ระบบ คือ ระบบประกันสุขภาพถ้วนหน้า ระบบประกันสังคม และระบบสวัสดิการรักษาพยาบาลข้าราชการในปีงบประมาณ พ.ศ. 2553 ซึ่งครอบคลุมประชากร ร้อยละ 96 ของประชากรของประเทศ*

ผลการศึกษา*: ข้อมูลผู้ป่วยนอกที่มารับการรักษาทางตาทั้งสิ้น 4,982,025 ครั้ง และผู้ป่วยใน 187,080 ครั้ง ผู้ป่วยนอกมาพบจักษุแพทย์ด้วยโรคของเยื่อบุตา (H10-H13) มากที่สุด รองลงได้แก่ โรคของเปลือกตา ท่อน้ำตาและเบ้าตา (H00-H06), ความผิดปกติของแก้วตา (H25-28), โรคของตาขาว กระจกตา ม่านตา (H15-H22) และโรคต้อหิน (H40-H42) ตามลำดับ ผู้ป่วยในมานอนรักษาในโรงพยาบาลด้วยความผิดปกติของแก้วตา (H25-28) มากที่สุด รองลงมาได้แก่ โรคของเยื่อบุตา (H10-H13), โรคของตาขาว กระจกตา ม่านตา (H15-H22), โรคของคอรอยด์และจอตา (H30-H35) และโรคต้อหิน (H40-H42) ตามลำดับ*

สรุป*: ข้อมูลการเจ็บป่วยทางตาที่พบบ่อยร่วมกับข้อมูลโรคตาที่มีความเสี่ยงสูง มีผลกระทบต่อการมองเห็น หรือโรคที่มีค่าใช้จ่ายสูง สามารถนำมาใช้ในการจัดหลักสูตรการเรียนการสอน และการฝึกอบรมของบุคลากรทางสาธารณสุข ใช้ในการวางแผนพัฒนาการบริการ และใช้เป็นฐานข้อมูลในการทำงานวิจัย*