Status of Ophthalmic Education and the Eye Health Workforce in South Asian Association for Regional Cooperation Countries

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Purpose: This study aimed to assess the capacity for ophthalmic education in the 8 South Asian Association for Regional Cooperation (SAARC) countries and to determine the need and future projections of eye health professionals in the region.

Design: This was a retrospective study and comprised desk review and Web-based questionnaire.

Methods: Developed in the Asia Pacific region, the Capacity Assessment Tool for SAARC Eye Care Education, a Web-based survey mechanism derived from a 12-point framework, was used to collect data on the number of ophthalmologists and other eye care personnel, training institutions, and capacity for training in each SAARC country.

Results: There are an estimated 17,568 practicing ophthalmologists and 4086 ophthalmic subspecialists in the SAARC region. The population per ophthalmologist is approximately 92,270. Allied eye health professionals constitute an important element of the eye health workforce and have a population per allied eye health professional of approximately 99,852; the ophthalmologist to doctor (physician) ratio is 1:61. There are more than 510 centers providing ophthalmology training and more than 32 centers providing subspecialty training; ophthalmic subspecialty training varies from a 3-month observernership to a 12-month hands-on training.

Conclusions: In the SAARC region, the challenge is to sustain and increase the eye health workforce to meet the needs of a growing and aging population. The demographic transitions, improved child survival and life expectancy rates, and emerging noncommunicable disease trends require training of ophthalmic subspecialists and supporting eye care teams to meet the service demands of changing eye health paradigms.

Key Words: ophthalmology, training, education, subspecialty, SAARC


The South Asian Association for Regional Cooperation (SAARC) region is composed of 8 countries—Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. The region is home to a total population of 1621 million, which includes more than 100 million people who are visually impaired.1 India alone has approximately 53,000 people visually impaired per million population.

Although vision loss due to cataract comes under increasing control with development of district eye care services and the training of general ophthalmologists and eye care teams, the need for subspecialists to manage other eye conditions becomes even greater. For example, childhood survival rates are improving in the region, but changing lifestyles and poor nutritional awareness have led to increasing obesity and a surge in diabetes. High-quality vitreoretinal services will be needed in all SAARC countries to meet the growing demand of ocular complications from diabetes. Glaucoma too remains a persistent challenge to prevention and control programs given its need for highly specialized diagnostic facilities and surgical management.

Global prevention of blindness is high on the agenda of VISION 2020: The Right to Sight. This worldwide initiative to eliminate avoidable blindness by the year 2020 is a joint program of the World Health Organization (WHO), the International Agency for the Prevention of Blindness, and international nongovernmental organizations. The goal of global blindness prevention, however, cannot be achieved without superior eye care delivery at all levels, which to large extent is dependent on high-quality training of ophthalmologists and allied eye health professionals (AEHPs).

Although there is an immediate need for subspecialist services in the SAARC region along with training of more AEHPs, the number of subspecialty training programs is minimal. The WHO’s World Health Report 2006, Working Together for Health,2 identified the following SAARC regional countries as “human resources for health” crisis countries: Eastern Mediterranean, Afghanistan, Pakistan, Southeast Asia, Bangladesh, Bhutan, India, Nepal. There has been a gradual increase in per capita spending on health in the SAARC region, with a corresponding increase in life expectancy. Global data, however, indicate that Southeast Asia has approximately 28% of the global burden of disease but with only approximately 12% of the global health workforce.2 The 2007 report, Everybody’s Business, presented the WHO’s framework for strengthening health systems to improve health outcomes. The report identified an effective health workforce as a critical component of the health care system.3 The WHO’s Task Force for Scaling Up Education and Training for Health Workers 2008 report, Scaling Up, Saving Lives, built on this point and emphasized the need for quality assurance systems and quality standards for training, service, and monitoring.4

Collaborative Effort

At a 2011 meeting in Bangladesh, the council of the SAARC Academy of Ophthalmology (SAO) discussed the high prevalence of avoidable blindness and visual impairment in the SAARC...
region and its interconnection to the difficulty in obtaining quality eye care in the area. The council specifically identified the lack of well-trained and motivated eye care personnel as critically impeding access to quality eye care.

Determined to enhance ophthalmic postgraduate education and improve the quality of ophthalmic care in the SAARC region, the SAO council made 2 important decisions; these are as follows: first, to establish the SAARC Foundation whose mandate is to improve the standard of eye health education and ophthalmic research; and second, to collaborate with equally committed partners to develop eye health human resources and improve the quality of ophthalmic care in the SAARC region.

As a primary step, the SAO contacted the International Council of Ophthalmology (ICO) in recognition of the ICO’s mission to work with ophthalmologic societies and others to enhance ophthalmic education and improve access to the highest quality eye care. In its 2011 to 2015 strategic plan, the ICO assigns high priority to developing teams of eye care professionals led by well-trained ophthalmologists and to strengthening and supporting systems to improve ophthalmic education. In 2011, a delegation from the SAO met with the president of the ICO and his team in Sydney, Australia, where they agreed to partner together to enhance subspecialty training in the SAARC region.

The Fred Hollows Foundation (FHF), a leading nongovernmental organization working in eye care in Australia, the Pacific, South Asia, Southeast Asia, and Africa, joined the collaboration shortly thereafter. With subspecialty development as one of their priorities, the FHF brought technical and generous financial support to the team. At a 2011 meeting in Kuala Lumpur, Malaysia, the SAO, ICO, and the FHF decided that the first steps in improving the quality of ophthalmic care in the SAARC region were as follows:

- assess institutional capacity for ophthalmic education, especially subspecialty training, in the SAARC countries;
- determine the need and future projections of key AEHP in the region; and
- develop an assessment tool that could be used in other regions and countries.

**MATERIALS AND METHODS**

On recommendation of the SAO, ICO, and FHF, a methodology was devised to determine the need and future projections of key AEHPs in the SAARC countries and to assess institutional capacity for ophthalmic education in the region. Desk research of currently available capacity assessment tools and methods was undertaken. Based on research results, a 12-point framework was developed from which a Capacity Assessment Tool for SAARC Eye Care Education (CATSEYE) was designed.

The 12-point framework included the following:

1. profile—population of the country and number of categories of eye health professionals;
2. public—institute in public sector attached to a general or eye hospital and sources of funding;
3. private—institute in private sector attached to a general or eye hospital and sources of funding;
4. program O—types of ophthalmology training programs offered, duration, and subspecialty rotation;
5. program A—types of AEHP training programs offered and duration;
6. people—number of faculty for ophthalmology and subspecialty training programs;
7. process—selection criteria for enrollment of candidates to ophthalmology and subspecialty training programs and whether curriculum is approved by an accrediting body;
8. practice—type of training (eg, theoretical, practical, observational);
9. portfolio—type of subspecialty services offered (eg, vitreoretina, pediatric ophthalmology, cornea);
10. procedures—subspecialty procedures available (eg, diagnostic, surgical, therapeutic);
11. performance—whether subspecialty training assessment includes experience certificate, competency-based assessment, and/or performance appraisal examination; and
12. product—qualification offered and whether qualification is accredited and registrable with a professional body or council.

The Web-based application of CATSEYE used MySql, which is an open-source relational database management system that runs as a server providing multiuser access to a number of databases. The CATSEYE was pretested and debugged and was configured to work with the most commonly used Internet browsers and on Windows, Linux, and Apple operating systems. Focal persons were requested to provide a list of SAARC training centers for ophthalmology, including subspecialty training centers. A list of 81 training centers was obtained, which served as the basis for the survey.

Before data collection, an e-mail was sent to alert all listed training centers. This served 2 purposes; these are as follows: first, to establish a communication link, and second, to test whether the e-mail was functional. Several e-mail addresses were found to be either nonfunctional or inappropriate; the e-mail addresses were updated, and the appropriate contact names were noted.

A second e-mail was then sent to the revised list of contacts providing a brief background of the survey and requesting contacts to open a Web link to the online questionnaire. A reminder e-mail was sent to those who had not completed the survey within 10 days. The data were cleaned for duplicate entries, incomplete forms that were accidentally submitted, or incorrect submissions.

The questionnaire included questions on the following areas:

- participating institution—type of institution (government, private, or nongovernment) and its income source;
- type and duration of training program offered in ophthalmology—residency or other;
- type of AEHP trained and type and duration of training program offered;
- number of teaching faculty and students;
- type of selection process for postgraduate students and candidates for subspecialty training;
- practice of training—theory, observational, or practical;
- type of subspecialty services offered at the institution;
- areas in which subspecialty training is offered;
- type of performance assessment for subspecialty training; and
- accreditation status of the subspecialty training program.

The following categories of eye health professionals were used for the survey:

- ophthalmologists;
- ophthalmic subspecialists; and
- the AEHPs, which included optometrists, orthoptists, ophthalmic assistants, and ophthalmic nurses.

Fourteen subspecialty areas (corresponding to subspecialty areas used by the ICO) were identified; these are the following:

- cataract and lens;
- community eye health;
- contact lens;
- cornea and external diseases;
- glaucoma;
• low-vision rehabilitation;
• neuro-ophthalmology;
• ocular oncology;
• oculoplastic surgery and orbit;
• ophthalmic pathology;
• pediatric ophthalmology and strabismus;
• refractive surgery;
• uveitis and ocular inflammation; and
• vitreoretinal diseases.

The following subspecialty levels were used:
• Level 1—general ophthalmologist who has an interest in that subspecialty and spends 50% or more time working in it but does not have a formal subspecialty qualification in it;
• Level 2—general ophthalmologist who has been trained in a subspecialty training center for less than 12 months; and
• Level 3—general ophthalmologist who has been trained in a subspecialty training center for at least 12 months or more.

RESULTS
There was an 84% response rate of contacts completing the online survey.1 The data received were then analyzed and tabulated.

Although variations exist among the regional countries, SAARC as a region has 1 ophthalmologist for approximately 92,000 population (Table 1).5–24 India and Pakistan have population per ophthalmologist of less than 90,000. Table 1 summarizes the key findings of the SAARC countries.

The survey indicated similar ratios of AEHPs and ophthalmologists to total population. Bhutan and Sri Lanka have 9 or more AEHPs to every ophthalmologist. Sri Lanka and Afghanistan, however, have much fewer ophthalmologists (Table 1).

Optometry training is gradually increasing in the SAARC region. In India, there are at least 30 schools and colleges of optometry affiliated with the Association of Schools and Colleges of Optometry in India (further details can be obtained from www.asco-india.org). For India, the numbers of optometrists and orthoptists need to be interpreted as a combined workforce because most orthoptist training is part of the optometry training program.

The status of subspecialists in the SAARC region varies from country to country. The highest number is seen in India, where approximately 4000 ophthalmologists practice as subspecialists. Other than India, which has 300,000 population per subspecialist, all other SAARC countries have more than 1.5 million population or more per subspecialist.

The type and duration of subspecialty training vary within the SAARC region. This may range from a 3-month observership to a 12-month hands-on training course. Countries such as India, Nepal, Pakistan, and Sri Lanka have nationally approved curricula for subspecialty training. India has nationally approved curricula for 13 of the 14 ICO-defined subspecialties, whereas Nepal, Pakistan, and Sri Lanka have only 3 to 4 of the 14 ICO-defined subspecialties.

In Bangladesh, for example, there are well-trained subspecialty fellows with 12 months of training who are practicing in their chosen area of expertise. There is, however, no nationally accredited subspecialty training center for at least 12 months or more.

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<th>Table 1. Status of the Eye Health Workforce in SAARC Countries</th>
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Summary of key findings regarding the status of the eye health workforce in SAARC countries.

*Ophthalmologists.
†Ophthalmic subspecialists.
‡Optometrists.
§Orthoptists.
||Ophthalmic assistants.
*Ophthalmic nurses.
#ODR.
**AEHPs.

AFG indicates Afghanistan; BGD, Bangladesh; BTN, Bhutan; IND, India; MDV, Maldives; NPL, Nepal; PAK, Pakistan; SLK, Sri Lanka.
curriculum for subspecialty training, nor any formal training program. There is good potential to use the existing faculty for subspecialty training programs in the various SAARC countries. A detailed directory of the participating institutions and organizations has been prepared and is available at www.icoph.org/SAARC-Ophthalmic-Education-Directory.pdf.

Other than India, subspecialty information was obtained directly from each country’s subspecialty organizations. Information for India had to be obtained from multiple sources (eg, SAO secretariat in Delhi, the All India Ophthalmological Society Web site, and the Medical Council of India Web site and statistical reports). There are at least 458 or more centers offering postgraduate training in ophthalmology in India. The National Board of Examination has 141 registered centers that provide postgraduate training in ophthalmology (details at www.natboard.edu.in). The Medical Council of India has 107 registered centers that offer training for a diploma in ophthalmology (details at www.mciindia.org). The Medical Council of India has 210 registered centers that offer training for masters in surgery in ophthalmology (details at www.mciindia.org). The total number of ophthalmologists obtained from the All India Ophthalmological Society may be an underestimate.

Supply and Need Projections

Human resource planning for eye health usually tends to be based on need. For instance, the need may be estimated by dividing a given population by the number of ophthalmologists or AEHPs in that particular country.

This does not take into account; however, supply mechanisms (ie, how many ophthalmologists does that country produce annually), pull factors such as creation of posts and attraction of further specialization, push factors such as ophthalmologists retiring annually or those who left a career for something else or who migrate to other countries nor does it take into account urban and rural disparities. In the absence of a more practical option or model to estimate the future supply and need, the use of an arbitrary indicator has provided a useful, if limited, planning formula.

Viewing the status of ophthalmologists per million population (Fig. 1)—Bhutan and the Maldives have been omitted from Figure 1 owing to their small population size—it can be observed that there are 2 major benchmarks, 11.9 and 5.2. The benchmarks suggest that India and Pakistan may need to aim in the short to medium term to have 15 ophthalmologists per million population, whereas the remaining 4 countries need to effectively double or at least triple their current numbers of ophthalmologists.

In comparison with other developed countries, it shows that they (developed countries) have a much higher ophthalmologist-to-million population ratio with an average of 38.6 per million (Fig. 1).

The comparison of 1 ophthalmologist per total population rates illustrates that developed countries have 3 times as many ophthalmologists compared with India and Pakistan and at least 7 times more than some of the other SAARC countries (Fig. 2).

Ophthalmologist-to-Doctor Predictor

Unlike dentists who start their training as dentists, a medical student graduates as a general physician and then chooses a specialty (eg, pediatrics, surgery, ophthalmology). The “market preference” for one medical specialty over another varies from country to country. Using a case study from Pakistan, we attempted to ascertain the relationship between the number of ophthalmologists and doctors because ophthalmology residents come from the pool of available doctors in that country.

The number of doctors (physicians) was determined from the Economic Survey of Pakistan and the Pakistan Medical and Dental Council Web site. The projection of the number of doctors for 2025 was based on the trend of the compound annual growth rate (CAGR) for the series and retaining the same for year 2035.

The actual and projected number of doctors up to the year 2035 is illustrated in Figure 3, which also shows the declining CAGR. Rate 1 shows a continuous declining CAGR based on declining rate, whereas rate 2 shows a steady state that is similar to 2025.

The number of ophthalmologists was determined from official planning documents, including the National Eye Health Plans (Ministry of Health, Government of Pakistan 1994–1998, 1999–2003, and 2005–2010).

The ratio of ophthalmologist to total doctors was compared, and it was found that during the 30-year period, the ratio remained constant at 1:70.

The ophthalmologist-to-doctor ratio (ODR) seems to be a useful and practical predictor of supply. Furthermore, although it was based on the number of doctors and the number of ophthalmologists, the effect of those who are retiring or leaving service would tend to cancel each other.

The need and supply of ophthalmologists in Pakistan are illustrated in Figure 4. “Required” (need) was estimated using 1:75,000 ratio. The current ratio is 0.92 per 75,000 population (Table 1). The rationale was to determine the nearest multiple of 5000 population figure for 1 ophthalmologist. Therefore, 1 per 75,000 was taken as the nearest whole number to estimate need.

To estimate those who were working, actual figures available are used up to 2012, and ODR is used for future projections.

The comparison of ODR of different regional and developed countries was done. The SAARC region has an average of 61 ODR, whereas the United Kingdom has an ODR of approximately 115, indicating that the SAARC region has approximately twice the proportion of ophthalmologists to doctors than the United Kingdom (Fig. 5).

Nepal has a very low ODR (or high percentage of doctors who are ophthalmologists), suggesting a preference for the specialty of ophthalmology among their doctors. Sri Lanka, Australia, and UK ODRs indicate that these countries probably have a shortage of ophthalmologists, or there are not enough training positions in ophthalmology or that the specialty is not among the top few preferred choices among doctors (Fig. 5). The findings indicate that there is a relative consistency in ODR rates among various countries. The 3 SAARC countries, Bangladesh, India, and Pakistan, demonstrate fairly steady ODRs during the 20-year period, whereas the 4 developed countries, Australia, Canada, United Kingdom, United States, indicate a nominal increase in ODRs. Taken individually, for example, in Australia and the United Kingdom, the decadal trend of ODR suggests fewer ophthalmologists in training compared with the pool of available physicians and overall population (Fig. 6).

The ODR trend in SAARC and developed countries is likely to have implications for changing disease patterns and aging populations, both of which require greater numbers of ophthalmologists and ophthalmic subspecialists.
Figure 7 illustrates a schematic model to estimate “supply” of ophthalmologists at a time in the future. The model has 5 key steps; these are as follows:

Step 1—estimate the population in the future using the population figure from official sources (eg, census departments) and apply a CAGR to make future projections for a time series;

Step 2—estimate the number of doctors (general physicians) by using actual figures from official sources (eg, medical councils) and apply a CAGR to make future projections for the time series used in Step 1;

Step 3—estimate the “need” of ophthalmologists by applying an appropriate ratio for the respective country (eg, we used 1 per 75,000 population as explained earlier; one can also use other variations, such as number per million population; Table 1) for the time series used in Step 1;

Step 4—using the estimates from Steps 2 and 3, determine the ODR for the past by dividing the number of doctors by the number of ophthalmologists for the past time series used in Step 1. The ODR can then be used for Step 5; and

Step 5—use the estimates established in Step 2 for the number of doctors in a time series, divide the numbers of doctors by the ODR to estimate future supply (or likely availability) of ophthalmologists. The difference between need (calculated in Step 3) and supply (calculated in Step 5) would help establish the gap that needs to be addressed.

**DISCUSSION**

The list of training centers in the 8 SAARC countries was provided by focal persons and may not represent a complete list of all training centers. Although there was an 84% response rate, not all of the listed training centers responded, so the percentages obtained may underrepresent the situation in a particular country. The time and limitation of resources did not permit an onsite validation of data for each center that responded to the questionnaire. The survey also did not make any distinction among ophthalmologists who were practicing, retired, and surgically active because this information was considered difficult to obtain. Thus, the total numbers are estimates rather than absolute.

This initial study was limited in its ability to collect detailed information about India, and the numbers obtained for
India are likely an underestimate. Further analysis and a follow-up study in India are warranted.

Based on the data obtained by CATSEYE, the following information was learned:

- approximately 17,568 ophthalmologists and an estimated 4086 ophthalmic subspecialists practice in the SAARC region;
- the ophthalmologist to population ratio in SAARC countries is approximately 1:92,270 and 10.84 per million population;
- the AEHPs constitute an important element of the region’s eye health workforce and have a population ratio of approximately 1:99,852 and 10.01 per million population;
- the ODR (physician) is 1:61 in the region; and
- more than 510 centers provide ophthalmology training and more than 32 centers provide subspecialty training across the region.

An interesting finding of the survey was the similar ratios of AEHPs and ophthalmologists to total population. In this regard, Bhutan and Sri Lanka have 9 or more AEHPs to every ophthalmologist. Sri Lanka and Afghanistan, however, have much fewer ophthalmologists (Table 1). This indicates that ophthalmology training would be a priority in these countries, whereas Pakistan, for instance, might need to intensify efforts to train more AEHPs.

Countries with a shortage of ophthalmologists or fewer ophthalmologists in training compared with the pool of available physicians and overall population (Figs. 5, 6) support the necessity to train eye care teams led by ophthalmologists to meet the requirements of communities. This need is especially critical when considering the implications of changing disease patterns and aging populations.

In the SAARC region, the challenge is to sustain and increase the eye health workforce to meet the needs of a growing and aging population. The demographic transitions, improved child survival and life expectancy rates, and emerging non-communicable disease trends require training of ophthalmic subspecialists and supporting eye care teams to meet the service delivery demands of changing eye health paradigms.

**Recommendations**

Based on a combination of desk research, telephone interviews with the national coordinators for eye health and the findings obtained by CATSEYE to access the capacity for...
ophthalmic training in the 8 SAARC countries, the ICO, SAO, and the FHF suggest the following policy recommendations for the SAARC region:

- facilitate a high-level meeting of heads and specialty coordinators of ophthalmic professional bodies in SAARC countries to develop a regional policy/strategy on ophthalmic education (including subspecialty training) and determine priority areas for joint action;
- launch a regional forum or task force on human resources for eye health, whose purview may include standardization of definitions, to act as a catalyst in developing guidelines for roles and responsibilities of different professionals in the eye health workforce; recommend minimum service delivery standards for human resources for eye health; develop an essential subspecialty training curriculum and practical requirements for the subspecialties; design performance appraisal modalities, monitor quality, etc;
- mobilize a regional faculty to promote technical cooperation among developing countries to participate in subspecialty training across countries;
- define standards for subspecialty training centers by analyzing gaps and initially strengthening centers that have the capability and capacity to provide subspecialty training; and
- foster collaboration with international partners to actively promote ophthalmic graduate and subspecialty training and to support the functioning of a regional forum, such as eye health partnership for professional advancement to accelerate efforts in this regard.

FIGURE 5. Selected countries and ODR. The comparison of ODR of different regional and developed countries was done. The SAARC region has an average of 61 ODR, and the United Kingdom has an ODR of approximately 115, indicating that the SAARC region has approximately twice the proportion of ODR than the United Kingdom. Nepal has a very low ODR, suggesting a preference for ophthalmology among their doctors. Sri Lanka, Australia, and UK ODRs indicate that these countries probably have a shortage of ophthalmologists, or there are not enough training positions in ophthalmology or that the specialty is not among the top few preferred choices among doctors.

FIGURE 6. Selected countries and ODR decadal trends. Bangladesh, India, and Pakistan demonstrate fairly steady ODRs during the 20-year period, whereas Australia, Canada, United Kingdom, and United States indicate a nominal increase in ODRs. Taken individually, for example, in Australia and the United Kingdom, the decadal trend of ODR suggests fewer ophthalmologists in training compared with the pool of available physicians and overall population.
To meet the goal of global blindness prevention in the SAARC countries and beyond, superior eye care delivery at all levels is needed, and it is dependent to large extent on high-quality training of ophthalmologists and AEHP workers.

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