

ORIGINAL RESEARCH

Regional disparities in human resources and infrastructure in public eye care services in Uzbekistan

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ABSTRACT

Background: In Uzbekistan the number of people with visual impairment has reportedly doubled since 2002. *Towards universal eye health: a global action plan 2014–2019* is a WHO initiative that aims to eliminate avoidable visual impairment and blindness and to reduce the number of people with visual impairment by 25% through improved provision of eye care. The objective of this study is to examine the regional disparities in human and technical resources and infrastructure in eye care in Uzbekistan, using the WHO initiative's indicators.

Methods: All public health care facilities providing eye care services in Uzbekistan were invited to participate in the study. The survey questionnaires were adapted from the VISION 2020 situation analysis data collection tool and included questions to

elicit general information and data on infrastructure and human and technical resources. The self-administered questionnaires were sent to and collected from the facilities electronically.

Results: The results of the study revealed an uneven allocation of human and technical resources among the 13 regions of Uzbekistan and the capital, Tashkent.

Conclusion: Disparities were found between the capital and the Uzbek regions. The results show a strong need to improve the current situation of uneven allocation of resources by reducing the gaps in availability of human resources for eye health, equipment and facilities, as well as promoting eye health as a key factor to achieve the goal of the WHO initiative to reduce the number of people with visual impairment by 25%.

Keywords: EYE CARE, HUMAN RESOURCES FOR HEALTH, REGIONAL DISPARITIES, UZBEKISTAN

BACKGROUND

Globally, 285 million people have some form of visual impairment, equating to 4.2% of the world's population. Of these, 39 million are blind (1). Using disability-adjusted life-year (DALY) calculations, visual impairment is considered the seventh leading cause of disability in the world (2), but 80% of all causes of eye diseases may be prevented or treated. Of people with visual impairment, 90% live in developing countries. Two main reasons for visual impairment are uncorrected refractive errors (42%) and cataracts (33%) (1). In 2010, 82% of blind people and 65% of people with mild or severe visual impairment were aged over 50 years. With an ageing global population, there is a high chance that visual impairment and blindness will increase (2).

Cost, fear of doctors or treatment and lack of transportation are some of the barriers to accessing eye care (3). Lack of transportation and distance from medical institutions are major problems, particularly in developing countries, and contribute to lower access to care. For instance, a study in Pakistan (4) found that due to lack of access to health services the prevalence of blindness is three times higher in impoverished than in industrialized areas.

In Uzbekistan the number of people with visual impairment has reportedly doubled since 2002 (5). This implies a growing demand for eye health services. Uzbekistan is a Member State in the WHO European Region, whose population includes around 10% of the visually impaired population globally (6). Data for the Region are sparse, and it consists of countries with different levels of development.

Towards universal eye health: a global action plan 2014–2019 is a WHO initiative to eliminate avoidable (treatable or preventable) visual impairment and blindness. It aims to reduce the number of people with visual impairment by 25% through improvement of eye care systems (1). To achieve this, evidence-based information on the magnitude of the prevalence of visual impairment and blindness and on availability and accessibility of ophthalmic health services are required.

Uzbekistan has 12 regions and one autonomous republic, with a population of over 30 million, 3 million of whom live in the capital, Tashkent. There are 11 regional eye hospitals, two republican hospitals and two specialized eye health centres. As well as these governmental facilities, ophthalmological care is provided by private specialized and multidisciplinary clinics and spectacle-manufacturing workshops, which offer either primary, secondary or tertiary care. Private eye clinics are mainly concentrated in urban areas.

This study is the first of its kind to systematically measure the availability of eye care services in Uzbekistan, examining regional disparities in human and technical resources and infrastructure for eye care using the indicators of the WHO initiative, *Towards universal eye health: a global action plan 2014–2019*. Based on its results, it is possible to compare the operational capacity and availability of human resources and equipment across the country's regions.

METHODS

The authors conducted a cross-sectional questionnaire survey of public sector eye health care providers in Uzbekistan. All public sector health care facilities providing eye care services were invited to participate. The facilities known before the study were specialized eye care facilities, which coordinated the collection of data from other secondary and primary care eye care facilities. All the facilities are controlled by the country's head ophthalmologist, who is appointed by the Ministry of Health, and each region and the capital also have their own head ophthalmologist. All head ophthalmologists were contacted prior to the study and provided with instructions. They were then sent self-administered questionnaires to complete on behalf of the facilities, which also explained the study's objective and procedures, and included questions about the facility. The first two pages explained the purpose of the study and gave instructions on how to complete the questionnaire. Additionally, pages of the questionnaire were divided into four sections: (1) general information, such as name, location, type of facility, level of care, number of beds for eye care and number of cataract surgeries per year for 2013 and 2014; (2) a list of equipment, including the availability, quantity and condition of the equipment; (3) a list of services provided by; and (4) general information about human resources, such as the number of professional staff available and their role, specialization and eye care professional category. The questionnaires were sent to and collected from the facilities electronically. Data were collected between July and August 2015.

The questionnaire was adapted from the VISION 2020 situation analysis data collection tool with reference to the International Agency for the Prevention of Blindness's *Standard list of equipment, drugs and consumables for VISION 2020 eye care services units* (7, 8). Further adaptations were made in consultation with local ophthalmologists. The list of equipment was adapted to align with the minimum requirements for eye care services established by the Ministry of Health, and translated to the local language.

Ethical approval was provided by the Research Ethics Committee of the Faculty of Medicine at the University of Tsukuba, Japan.

RESULTS

TYPES OF FACILITY

Health services for eye care are provided at the levels of care described in Table 1. The levels of care were defined using the Situation analysis of VISION 2020 of the WHO South-East Asia Region (7). In addition, each facility had to define its levels of care depending on the available services described in Table 1. The number of rural physician points originated from the Ministry of Health. For the purpose of this study, rural physician points are defined as small facilities that provide primary care specifically in rural areas. Rural physician points do not provide services of eye care specialists; hence it was decided to divide eye care services into three categories. However, it is important to mention that rural physician points provide services of general practitioner as well as referral services. Rural physician points were not included in the study, but are mentioned to illustrate the availability of referral services in rural areas. Four tertiary specialized hospitals provide advanced surgical procedures, which require expensive equipment and highly qualified personnel. Secondary care such as cataract and glaucoma treatment is provided by 20 hospitals, medical centres and specialized hospitals. Basic eye care services are provided by 553 institutions; these are mainly regional, district and town hospitals, outpatient hospitals (polyclinics) and health centres that provide diagnostic and referral services, with one or two ophthalmologists at each unit. Aside from institutions providing ophthalmological care, 2958 rural physician points provide general practitioner services, including vaccination and referral services.

TABLE 1. AVAILABLE PUBLIC EYE CARE SERVICES

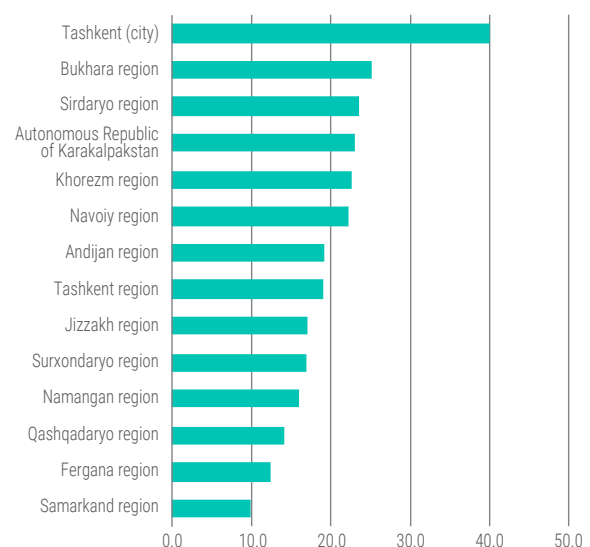
Level of care	No. of facilities	Description
Rural physician points	2958	Health centres located in rural areas with one or several general practitioners
Primary (diagnostic, refractive and referral services)	553	Regional, district, town general hospitals, outpatient hospitals (polyclinics), health centers providing diagnostic, refractive and referral services
Secondary (cataract surgery, glaucoma detection and therapy)	20	General hospitals and specialized hospitals providing basic surgical procedures, including cataract and glaucoma treatment
Tertiary (advanced surgical procedures, including vitreo-retinal surgery and laser photo-coagulation)	4	Specialized eye hospitals providing advanced surgical procedures, including vitreo-retinal surgery and laser photo-coagulation

DISTRIBUTION OF THE FACILITIES

Each region of Uzbekistan and the Autonomous Republic of Karakalpakstan has at least one secondary or tertiary facility providing eye care services. Most such facilities, however, are concentrated in Tashkent, which has two tertiary specialized eye care facilities and nine specialized and non-specialized facilities providing secondary eye care. The facilities are unevenly distributed across the country, creating discrepancies between the capital and other regions.

Fig. 1 shows the distribution of eye care facilities per million population. Services are mainly provided at the primary care level (553 of the 577 facilities), with eye care units in most hospitals, polyclinics and health centres, while secondary and tertiary care is provided by less than 1% of all facilities. Three regions have 20

FIGURE 1. NUMBER OF FACILITIES WITH EYE CARE SERVICES PER 1 MILLION POPULATION (2014)



or fewer primary care facilities. The Samarkand region and the Autonomous Republic of Karakalpakstan have no facilities providing secondary care, although each has one tertiary eye care hospital. The only other tertiary facilities are in the capital, Tashkent.

HUMAN RESOURCES FOR EYE HEALTH

Fig. 2 represents the ratio of ophthalmologists to the population, showing a large difference in numbers between the regions and the capital. The capital, Tashkent, is the only area with more than 60 ophthalmologists per 1 million population. The lowest ratio is in the Sirdaryo region, with 23.6 ophthalmologists per 1 million population. The result for nurses is partially similar, with 158.1 per 1 million population for the capital and only 11 for the Tashkent region.

Data on demographic characteristics of human resources for eye health could only be collected from the Republican Clinical Ophthalmological Hospital and the Republican Specialized Centre for Eye Microsurgery, both in Tashkent. All physicians in the country are classified according to qualification or category, with three categories of highest, first and second. Each of the categories can be received with years of experience and accreditation every five years. There are also ophthalmologists without a category, who are usually young specialists. The mean age of ophthalmologists in the highest category ($n=33$) is 46.5, with 20.4 average years of practice, while age and years of practice within the highest category are 50 and 22, respectively. Females account for 67% of ophthalmologists, showing that gender still plays an important role in choice of specialization in Uzbekistan. Further, 100% of the nurses in the eye care facilities are female.

CATARACT SURGERY RATE (CSR)

The CSR refers to the number of cataract surgeries per year per 1 million population; this is one of the main indicators used in the *Towards universal eye health: a global action plan 2014–2019* initiative. For this study, CSR data were collected for 2013 and 2014. As can be seen in Fig. 3, CSR fluctuates by region, showing large discrepancies within the country. The highest rate is in the capital, at more than 2000 for both 2013 and 2014. The second highest rate is in the Sirdaryo region, while all other regions have quite low CSRs, leading to a very low national average of below 500: this is the lowest rate worldwide (9).

If the CSRs of the capital and the Tashkent region are combined, however, the overall rates are 1095 and 1020 for 2013 and 2014, respectively. The highest rate then occurs in the Sirdaryo region which has the smallest population. One possible reason for the low CSR in the Tashkent region is that the population has the opportunity to receive surgery in the capital.

FIGURE 2. NUMBER OF OPHTHALMOLOGISTS PER 1 MILLION POPULATION (2014)

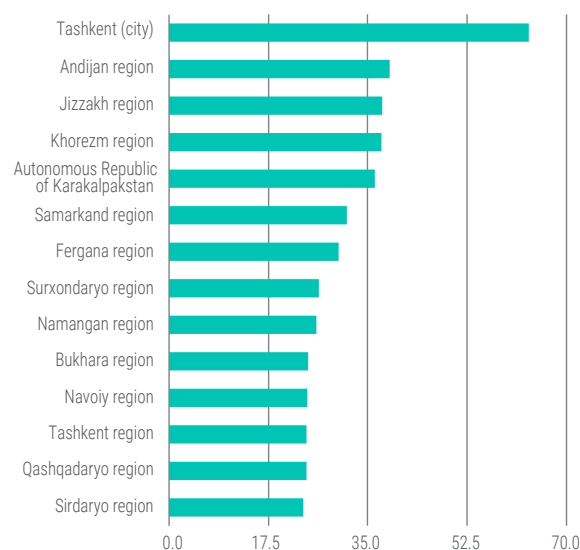


FIGURE 3. CSR 2013–2014

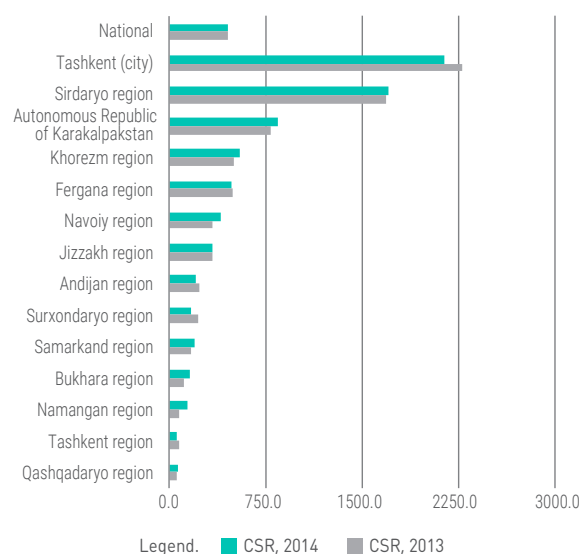


Table 2 presents detailed information on the process indicators of *Towards universal eye health: a global action plan 2014–2019* for each region.

TABLE 2. TOWARDS UNIVERSAL EYE HEALTH: A GLOBAL ACTION PLAN 2014–2019. PROCESS INDICATORS BY REGION/CITY (2014–2015)											
Region/city	Population in 2014 (thousands)*	Share of total population (%)	Number of facilities with eye care services**	Number of eye beds**	CSR in 2014	CSR per ophthalmologist in 2014	Number of ophthalmologists**	Number of operational theatres**	Number of ophthalmic nurses**		
Tashkent (city)	2352.9	7.7	40.0	68.9	2135.7	33.7	63.3	5.1	158.1		
Tashkent region	2725.9	8.9	19.1	14.7	57.6	2.4	24.2	0.4	11.0		
Samarqand region	3445.6	11.3	9.9	37.7	199.7	6.4	31.1	1.2	31.1		
Andijan region	2805.5	9.2	19.2	21.4	212.4	5.5	38.9	0.7	21.0		
Bukhara region	1756.4	5.8	25.1	43.3	160.0	6.5	24.5	1.1	32.5		
Fergana region	3386.5	11.1	12.4	29.5	488.7	16.4	29.8	0.9	57.0		
Jizzakh region	1226.8	4.0	17.1	63.6	340.7	9.1	37.5	1.6	70.1		
Qashqadaryo region	2895.3	9.5	14.2	25.9	65.3	2.7	24.2	0.3	60.1		
Khorezm region	1684.1	5.5	22.6	29.7	550.4	14.7	37.4	1.2	41.0		
Namangan region	2504.1	8.2	16.0	16.0	145.0	5.6	26.0	0.4	35.1		
Navoiy region	901.1	3.0	22.2	44.4	402.8	16.5	24.4	2.2	62.1		
Surxondaryo region	2308.3	7.6	16.9	43.3	170.7	6.5	26.4	0.9	64.5		
Sirdaryo region	763.8	2.5	23.6	45.8	1704.6	72.3	23.6	2.6	47.1		
Autonomous Republic of Karakalpakstan	1736.5	5.7	23.0	46.1	841.9	23.2	36.3	1.2	47.2		
TOTAL	30492.8	100.0	18.9	35.0	453.2	14.1	32.2	1.2	51.8		

* according to government statistics

** per 1 million population

DISCUSSION

This study analysed the regional disparities in human resources and infrastructure in eye care services in Uzbekistan. The results show visible disparities between the regions and the capital. The three leading eye diseases in the country are cataract, glaucoma and diabetic retinopathy, which are most common among the people aged over 50 years (1).

CSR

Despite the availability of eye care personnel, equipment and facilities, CSR in developing countries is still low compared to more developed countries of the WHO European Region and the world (10). According to the study results, the CSR in Uzbekistan's public facilities is below 500, making it among the lowest CSRs globally, alongside other countries in Africa and South-East Asia; however, most low- and middle-income countries in the world have a CSR of 1000 or more. Although the CSR in the capital Tashkent exceed 2000, bringing it close to some other European countries, the low rate for the whole country shows the enormous cataract surgery disparities among the regions.

CSR represents the incidence of cataract surgery and includes people of all ages while those who are in need of cataract surgery are typically people over 50 years. According to 2014 government statistics, people over 55 comprise nine percent of the entire population, the majority of which is concentrated in the capital, Tashkent, and in the Tashkent region (12.7% and 10.5%, respectively). Considering this, the majority of those at risk reside in the capital where CSR is the highest. However, the results of CSR also show disparities due to medical tourism within the country: those who are able to pay for transportation, surgery and other additional fees travel to leading cities in the country, particularly Tashkent, to undergo cataract surgery, resulting in higher rates in the capital and lower rates in their regions of origin. This might be considered another argument for improvement of the infrastructure in the country's regions. A good example of progress can be seen in India, where the CSR for the country doubled in 10 years, reaching 3000 in the year 2000 (9). This evidence shows that India has managed to provide identical services throughout the country.

Low service utilization remains the major problem for cataract surgery. Several common barriers are perceived by patients in developing countries, including fear of surgery, acceptance of impaired sight as an "inevitable consequence of old age", lack of knowledge, distance from services and many others (9, 10). High costs and poor quality of services also result in poor utilization of cataract surgery (11), and a lack of eye surgeons is another barrier to uptake. In countries where there is a definite lack of ophthalmologists, as in some countries in Africa, a separate specialization of cataract surgeon was created to meet the needs of the population (12). However, cataract surgeons in Uzbekistan are qualified ophthalmologists and their number would be sufficient to perform adequate number of cataract surgeries if adequately distributed. Further research is needed to identify the barriers to cataract surgery in the central Asian region.

One way to increase the CSR is to increase the number of ophthalmologists with specialization in cataract surgery, but in Uzbekistan an easier method would be to establish outreach services, as retention of ophthalmologists in the regions and rural areas seems a more difficult issue to tackle. Such outreach campaigns have sometimes been organized in the country, with specialists from leading tertiary specialized facilities travelling to regional eye care hospitals. They should be organized on a regular basis, however, and include not only specialized eye care facilities but also other secondary or tertiary facilities, given availability of equipment. The Baltussen et al. study (13) showed that cataract surgery has proven cost-effective in reducing the impact of cataract blindness: 95% coverage of extracapsular cataract surgery would avert 3.5 million DALYs per year globally. Nevertheless, despite the high coverage rate, more advanced cataract surgery techniques should be taught and considered as the main way treatment the disease.

ACCESS TO EYE CARE

Rural dwellers make up 49% of the population of Uzbekistan (14) and more than 50% of the population of most regions. However, outside the capital, even residing in urban areas of the regions of Uzbekistan increases the risk for lack of accessibility to health care services, and to ophthalmological services in particular. More generally, 76 million of the 86 million people in central Asia (88.2%), and over 95% of the population in lower-middle-income countries do not have access to surgical care (15). Limited availability and accessibility of health care services is considered a major barrier for patients (16).

No data are available for the differences in visual impairment prevalence between urban and rural areas of Uzbekistan, but a study conducted in Pakistan shows higher incidence of visual impairment and blindness among poor people, who are more likely to reside in rural areas (4). This may suggest a need for developing of ophthalmological services in rural areas of the country through modernization of equipment and training of personnel.

Apart from primary eye care or specialized secondary or tertiary eye care facilities, around 3000 rural physician points in Uzbekistan have general practitioners who also act as family doctors. Although they are trained to detect some basic eye diseases, this is not always feasible due to the lack of equipment, knowledge or motivation.

Most of the eye care facilities in Uzbekistan offer very limited services and require modernization of equipment and training of personnel. The available equipment provides very basic diagnostic services and is in need of replacement. More qualified personnel and advanced equipment are available in secondary and tertiary specialized hospitals, which are located in urban areas and the capital.

HUMAN RESOURCES FOR EYE HEALTH

Apart from the WHO initiative, *Towards universal eye health: a global action plan 2014–2019*, and its indicators, WHO has stressed that the number of eye specialists does not reflect the performance or quality of eye care services provided. Some countries in the WHO European Region have up to 100 ophthalmologists per 1 million people, but most of them deal with primary care only, leaving most of the population without appropriate secondary and tertiary care (11). The situation in Uzbekistan is similar. Most eye care health personnel work in primary eye care, with large disparities in availability of human resources between the regions and the capital. While the number of ophthalmologists per 1 million population in Tashkent is almost the same as the number in the United States of America, at over 60 (17), the indicator for the whole country is much lower, at around 32, which is the average for central Asia. Uzbekistan and Kazakhstan share a similar number of ophthalmologists per 1 million population, while Tajikistan faces a major problem regarding this issue. Physicians are more likely to move to areas with high physician density and urban locations (18).

The VISION 2020 situation analysis includes indicators for human resources consisting of ophthalmologists, cataract surgeons, optometrists, refractionists, ophthalmic nurses/assistants, community eye health-trained personnel and management-trained personnel. Uzbekistan's ophthalmological services consist only of ophthalmologists and ophthalmic nurses as there is no further division of specialties. The optometrist specialization scarcely exists in the country, while refraction services are provided either by nurses or by opticians in spectacles workshops, where available. There is no "technician" specialization at eye care facilities. Very few technicians in the country can deal with equipment purchased from overseas; all of them belong to representative offices of the companies manufacturing the equipment and work on a contract basis with the eye care facilities. Most health care facilities, both public and private, are managed by physicians with no managerial education. The situation is the same for ophthalmological services in the country: the directors and managers of the specialized eye care facilities and departments of ophthalmology are inactive or no longer practising ophthalmologists.

To deliver effective health services it is important to have skilled and motivated health workers "at the right place and at the right time" (19). Although the number of ophthalmologists in Uzbekistan may be high, surgically active ophthalmologists comprise only 15% of all ophthalmologists in post-Soviet countries (11). Another contributing

factor to the growth rate of ophthalmologists is the growth of the population, and especially the population aged over 50–60 years, which is the population at highest risk. Despite the overall growth of ophthalmologist numbers of 1.16% for lower-middle-income countries, overall growth of the population aged over 60 years is negative (–1.65%), which means that in spite of increases in numbers of ophthalmologists, the supply is still not sufficient for the population (19).

LIMITATIONS

This study has several limitations. One is the self-reported nature of the data. All hospitals are obliged to make records of every surgery and all equipment, but the reliability of medical records is questionable. Initially, the study was due to involve eye care services in both the public and private sectors, but due to the low response rate, the private sector could not be included. According to the Ministry of Health, around 14% of all ophthalmologists in the country work in the private sector. It should also be noted that private clinics conduct more cataract surgeries than the public sector. The absence of information from private clinics in Uzbekistan underestimates the CSR, which could be substantially higher than 453.2 for 2014.

CONCLUSION

This study found that both equipment and human resources are unevenly allocated, creating eye care facilities in need of development in terms of equipment modernization and personnel training. There are shortages of human resources in the regions, especially in rural areas. Allocation of resources should be optimized by policies formulated by the government. The main goal of the government should be development of an effective eye health care system to be integrated into the health system, ensuring attention to the demands on services and equity of availability.

The goal of this study was to report evidence of disparities among regions of Uzbekistan according to the objectives of the WHO initiative *Towards universal eye health: a global action plan 2014–2019*: “generation of evidence on the magnitude and causes of visual impairment and eye care services and using it to advocate greater political and financial commitment by Member States to eye health” (1). The study found disparities between the capital and the regions of Uzbekistan. The results show a strong need to improve the current situation of uneven allocation of resources by decreasing the gaps in the availability of human resources for eye health, equipment and facilities, as well as promoting eye health, as key factors to achieve the initiative’s goal to reduce the number of people with visual impairment by 25%.

Some authors (20) argue that integration of eye care into the primary level of care is an effective way to improve eye health systems through thorough supervision and training of primary health care staff (ophthalmologists in polyclinics and health centres; general practitioners in rural physician points). These techniques can and have already started to be implemented by Uzbekistan’s government. Nevertheless, more effective measures can be taken with the cooperation of the WHO initiative. The government already invests money in health care; however, Uzbekistan is in need of foreign investment and developmental programmes. The initiative might help not only in financial terms but also in terms of management, organization and facilitation of the programmes.

Acknowledgements: The authors are grateful to all ophthalmologists who participated in this study, the Republican Specialized Centre for Eye Microsurgery and the Republican Clinical Ophthalmological Hospital.

Source of funding: The Scholarship for International Students of the Japanese Ministry of Education, Culture, Sports, Science and Technology, Monbukagakusho.

Conflicts of interest: None declared.

Disclaimer: The views expressed in this publication are those of the authors alone, and do not necessarily represent the decisions or policies of the World Health Organization.

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