The conference sub-site was funded by the Ministry of Education and Science (Project: "Excellent Science – Support for scientific conferences") under the project entitled: "Implementation of two editions of the online scientific conference "Miopia" in 2023 and 2024" contract No. DNK/SN/549820/2022)

Myopia 2023

Post congress report.

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The Foundation for the Development of Ophthalmology "Ophthalmology 21", together with Polish Ministry of Education and Science, Department of Ophthalmology at the University of Warmia and Mazury in Olsztyn, European Network for Myopia Prevention and Control and the company MAG21 Sp. z o.o., organised on **June 9, 2023** the scientific conference **"Myopia 2023"** - the first scientific conference in Poland fully dedicated to myopia. During the event, lectures were given by a total of **13 experts from all over the world**, who presented practical aspects related to the diagnosis and treatment of myopia in their countries of origin. The scientific conference 'Myopia 2023' was divided into four sessions. In the first session entitled ***Practice patterns in myopia control in Asia***, lectures were given by Prof. Calvin CP Pang from The Chinese University of Hong Kong (Hong Kong), Prof. Alvina Pauline Santiago from the University of Philippines (Philippines) and Prof. Ryo Kawasaki from Osaka University Graduate School of Medicine (Japan). In the second session entitled ***Practice patterns in myopia control in Europe***, lectures were given by Prof. Dominique Bremond-Gignac of Paris Cité University (France), Prof. Yair Morad of Sackler Faculty of Medicine, Tel Aviv University (Israel) and Prof. Wolf Lagrèze of University Medical Center Freiburg (Germany). In the third session, entitled ***Practice patterns in myopia control in Poland***, lectures were given by Prof. Andrzej Grzybowski from the University of Warmia and Mazury in Olsztyn, Dr Mieszko Lachota from the Children's Memorial Health Centre in Warsaw and Dr Julia Dezor-Garus from Ophthalmology Department of Medical University in Poznań. During the final session, entitled ***Practice patterns in myopia control in North and South America***, lectures were given by Dr

Michael Xavier Repka from the Johns Hopkins Medicine Home Wilmer Eye Institute in Baltimore (USA), Dr Rafael Iribarren, representing Iribarren Eye Consultants in Buenos Aires (Argentina) and Dr Jennifer Hyuna Kim Lee from the Instituto de Oftalmología FAP Conde de Valenciana IAP in Mexico City (Mexico). At the end of each session, a discussion was held between the speakers and the moderator. All lectures are available by registering on the website:

https://miopia.pl/login/?redirect_to=https%3A%2F%2Fmiopia.pl%2Feuropean-network%2F

Summaries of the most important lectures are presented below.

Session I

Alvina Pauline Santiago, MD, PHD (Philippines)

University of Philippines, Manila; Manila Doctors Hospital

Practice patterns in myopia control in Philippines

Practical patterns of myopia control in the Philippines are discussed, namely: encouraging outdoors play and providing outdoor sensory pathways, reducing gadget time and near work, and even using the 20-20-20 rule when using gadgets or doing near work (every 20 min, look 20 feet away for at least 20 sec). The discussion on atropine included the metaanalysis of 0.01% showing equivocal results, low dose atropine for control of myopia progression using 0.02-0.05% was mentioned, and computations for reconstitution were presented.

Ryo Kawasaki MD MPH PhD

Professor, Public Health, Department of Social Medicine, Osaka University

Myopia in school children in Japan. Findings from a nation-wide survey 2021-2023

Introduction

Myopia, or nearsightedness, has become a growing concern worldwide, and Japan is no exception. Over the past few decades, the prevalence of myopia has been on a steady rise.

Understanding the trends, causes, and possible interventions for myopia is crucial for the public health sector.

Historical Overview

Studies conducted in 1984, 1996, and 2017 have shown a consistent increase in myopia among school children in Japan. The prevalence of myopia at age 10, for example, doubled over the 10-year period between 1984 and 1996 and then quadrupled further by 2017. Furthermore, these trends suggest not only that the onset of myopia is occurring at younger ages but also that the proportion of more severe myopia at the same ages has increased.

Impact of the COVID-19 Pandemic

The COVID-19 pandemic brought about unprecedented changes to daily life, particularly for school children. Schools were shut down, outdoor activities were restricted, and remote schooling became a standard part of daily education. This shift led to a dramatic increase in screen time and a decrease in outdoor activities, factors known to be associated with the development and progression of myopia. To understand how the pandemic influenced myopia among school children, a thorough analysis of school health survey data was conducted. The findings revealed that elementary school children had a higher prevalence of myopia in 2020 than previously estimated.

Digital Transformation in Education

In 2019, a nation-wide educational program aimed at boosting digital device usage in elementary and middle schools was initiated. While this program's impact on educational outcomes is still under investigation, it also has implications for eye health, given the well-documented association between screen time and myopia.

The School Children Myopia Survey

Recognizing an urgent need to understand the epidemiology of myopia in school children, the School Children Myopia Survey was launched, supported by the Ministry of Education, Culture, Sports, Science, and Technology (MEXT). MEXT recruited 29 schools in 2019 from all over Japan.

Participants: The study's purpose and plans were explained to potential students and parents, resulting in 8607 students participating. Two hundred and four students opted not to participate.

Methods: Eye examinations were conducted between April and June in 26 schools and three schools in December. Data collected included school information, gender, anthropometric examination, and a wide array of ophthalmic examinations.

Findings from the baseline survey: The results showed geographical variations in myopia distribution across Japan and differences in outdoor behaviors between genders. The data also revealed an increase in screen time, with more than half of the households not having rules to limit screen exposure. Surprisingly, the provision of adequate corrective lenses was low, with less than 20% of grade 1 children using glasses or contact lenses. This figure only rose to almost 40% by middle school grade 3.

Discussion

The findings of this study are both alarming and informative. The observed increase in myopia prevalence, coupled with the lack of proper eye care, highlights the need for concerted efforts in prevention and management. The survey's strength lies in its nation-wide sampling, encompassing diverse demographics and providing a comprehensive view of the situation.

Implications

The study has several important implications, including the need for:

- Raising awareness about myopia and its risk factors.
- Implementing evidence-based prevention strategies.
- Ensuring access to adequate correction of myopia through glasses/contact lenses and emerging treatments.

Conclusion

The ongoing nation-wide myopia survey (2021-2023) in Japan is a significant step in understanding the growing issue of myopia in children. Baseline results suggest a myopic shift over age groups, potential geographical variations, and the current situation regarding children's lifestyles, especially related to outdoor activities and near work. The comprehensive approach adopted in this study sets a valuable precedent and provides insights that could guide future policy and interventions for the prevention and management of myopia in Japan and potentially other countries facing similar challenges.

SESSION II

Practice patterns in myopia control in France

Dominique Bremond-Gignac, MD, PhD[1,2]

[1] Ophthalmology Department, Necker-Enfants Malades University Hospital, AP-HP, Paris University, Paris, France.

[2] INSERM, UMRS1138, Team 17, From physiopathology of ocular diseases to clinical development, Sorbonne Paris Cité University, Centre de Recherche des Cordeliers, Paris, France.

Children's eye is not a miniature eye, it grows! The axial length increases naturally with age, however when the growth of eyeball occurs in excess, it signs the myopia onset. The medicoeconomic issues in myopia are wild and expensive. The cost has been evaluated at 268 billions/year with blindness risk, and remains a global public health concern. Thus, in children the challenge with myopia is Prevent, Recognize, Evaluate, Explore, Correct, Control. Myopia induces in children; blurred vision and this refraction anomaly needs to be fully corrected for a good visual development. The first challenge in France is to recognize myopia with appropriate screening. An initial complete check-up allows adapted correction after measures under cycloplegia. A French survey on myopia found that 51% of participating persons does not give a good definition of myopia and in myopes, 34% does not give a good definition of myopia. The questionnaire also demonstrated that children present a major increase in daily screen time. An epidemiological study of 100,429 French myopic patients found an overall prevalence of myopia was 39.1% (95% CI 38.8-39.4). The French practical patterns include for all advices for environmental measures. Control therapies in myopia includes defocus glasses, defocus contact lenses, orthokeratology, low-dose atropine and all of these optical systems or eyedrops are available in the country. The system is chosen with parents and the child to have a customized myopia control solution. The cost, the age of the child, the time of adaptation, the ease of adaptation will guide the choice. For the optical solutions, robust studies of the device are preferred and selected. Combined systems in severe evolutive myopia are useful like defocus lenses with atropine or defocus contact lenses with atropine. However, there is a need of long studies to evaluate long efficacy and rebound.

Yair Morad, MD, PhD (Israel)

Sackler Faculty of Medicine, Tel Aviv University

Practical Patterns in Myopia Control in Israel: Insights from a Diverse Population and National Health

Myopia is a burgeoning global concern with profound implications for public health. Israel, boasting a diverse population and robust national health system, presents a good opportunity to conduct comprehensive myopia studies. This abstract provides a concise overview of research focusing on the prevalence of myopia and practical patterns in myopia control within Israel.

Firstly, Israel's compulsory military conscription has generated a vast and accurate database, containing the refraction data of every Israeli at age 16 since the 1970s. Leveraging this invaluable dataset, researchers can analyze trends and changes in myopia prevalence over time, yielding valuable insights into the condition's evolution.

Secondly, Israel's population has witnessed remarkable growth since its establishment in 1948, resulting in a diverse mix of immigrants and their descendants. This demographic diversity provides an excellent foundation for compelling comparison studies between various groups, offering valuable insights into potential genetic, environmental, or cultural factors influencing myopia development.

One of the studies presented explored the prevalence of myopia in Israeli conscripts between 1994 and 2003,[1] revealing a concerning up to 40% increase. Notably, low myopia exhibited a sharp rise, while high myopia rates remained relatively stable, indicating potential distinctions in underlying risk factors.

Another investigation delved into the influence of education systems on myopia rates among conscripts. The ultraorthodox education system, where children commence reading at the age of three and engage in extended indoor reading and praying, demonstrated an alarming 82% myopia rate at age 16.[2] In contrast, the orthodox system, with children starting reading at the age of 6 but spending additional time in prayer, exhibited a 50% myopia rate, and the secular system, where children spent only 5 hours a day in school, showed a 30% rate. These findings underscore the potential role of near work and visual habits in myopia development, interestingly noting that the prohibition of computers and smartphones in the ultra-orthodox system did not impact myopia rates.

Another study compared the myopia rates between conscripts of Ethiopian origin, who were born in Ethiopia and immigrated to Israel after the age of 5, and conscripts whose parents were Ethiopian-born but themselves born in Israel.[3] The study revealed a doubling of myopia rates in those born in Israel, suggesting potential environmental factors influencing myopia development.

Intriguingly, a study explored the correlation between cognitive function scores and myopia rates in adolescents, revealing a notable connection, particularly in verbal skills and arithmetic.[4] This intriguing relationship between cognitive abilities and myopia merits further investigation to better understand the underlying mechanisms. Additionally, a high correlation was found between myopia rates and school years, with high myopia demonstrating a stronger link to high cognitive scores than low myopia.

Regarding the association between light exposure and myopia, several studies were presented. Children born in summer months, spending less time outside at the age of 6 months, exhibited higher myopia rates compared to those born in winter months.[5] A parallel animal study involving chicks raised in different lighting conditions further supported the potential role of light exposure in myopia development, with chicks raised in dark conditions demonstrating significantly more myopia than those raised in bright light, the latter mostly being hypermetropic.[6]

Addressing myopia treatment, a study presented evidence that gradual secession of atropine treatment, achieved through a progressive reduction in drops over a 6-month period, resulted in significantly less rebound effect compared to prompt cessation. This finding holds profound implications for optimizing myopia management protocols and enhancing patient outcomes.

Finally, a new spectacle design aimed at reducing myopia progression in children was discussed. The U-shaped multifocal contour glasses, with a +3 addition in the periphery and no addition at the center, demonstrated promising results in a double-blind study involving 126 children. After one year, children wearing these innovative spectacles experienced significantly less myopia progression and axial length elongation, particularly those younger than 10 years and with two myopic parents. The study is planned to continue for a second year, with results currently pending.

In conclusion, the myopia studies conducted in Israel offer valuable insights into the prevalence and control of this growing global issue. The diverse population, abundant data resources, and access to nationwide healthcare make Israel a powerful test laboratory for understanding

myopia and implementing effective management strategies. Continued research in this field holds great promise for improving visual health and overall well-being, both within Israel and beyond.

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Wolf Lagreze, MD, PhD (Germany)

University Medical Center Freiburg

Practice patterns in myopia control in Germany

Myopia is the most common eye development disorder worldwide. Next the age, it is the second most common risk factor for serious eye, mainly retinal diseases later in life. The risk ratio increases almost exponentially with the state of myopic refraction. In Germany, approximately one quarter of boys and one third of girls are myopic by the end of puberty. At young adult age, the prevalences approaches almost 50%. Approximately one third of all children have a progression that warrants active myopia management. In addition to recommendations for minimal reading distance and sufficient outdoor time, highly diluted atropine has been

prescribed preservative-free for many years. For about a year, opticians have been offering multisegment lens spectacles. For severely progressive children, combination therapies are also used. Multifocal contact and OK lenses play a rather minor role. The corresponding recommendations are laid down in guidelines and treatment recommendations in our country. In contrast to many other countries, we have not observed a significant increase in myopia prevalence in Germany over the last 10-20 years.

SESSION III

Andrzej Grzybowski, MD, PhD (Poland)

Epidemiology and practice patterns of myopia control in Poland

In 2002, Dalz examined 4440 schoolchildren from the city of Poznan, 2427 girls and 2013 boys, aged 7–18 years. Autorefraction measurements were conducted after cycloplegia induced with 1% tropicamide. In whole group, the prevalence of myopia was 11.4% and increased from 0.4% in children aged 7 years to 22.0% in students aged 18 years. The prevalence of hyperopia decreased from 32.6% in children aged 7 years to 10.6% in students aged 18 years. (1) Czepita et al. reported the results of the refractive study in 4442 schoolchildren from the urban and semirural area of Szczecin, 2315 girls and 2107 boys, aged 6– 18 years. The ophthalmic examination included retinoscopy after cycloplegia induced with 1% tropicamide. This study showed that prevalence of myo- pia was 13.1% and increased from 2.0% in children aged 6 years to 32.6% in students aged 18 years. The prevalence of hyperopia decreased from 36.5% in children aged 6 years to 3.2% in students aged 18 years. (2) In both studies, significant increase in the prevalence of myopia was observed: between ages fourteen and fifteen in Dalz's study and between ages fifteen and sixteen in Czepita's study. In 2004, Szaflik et al. published the results of the refractive study in 1002 schoolchildren from the cities of Warsaw, Pultusk and Walbrzych. There were 505 girls and 497 boys, aged 6–16 years. Myopia was defined as spherical equivalent (SE) ≤ 0.5 dioptres (D), hyperopia as SE ≥ +0.5 D, and astigmatism was considered if the cylinder was ≥0.5 D. It was observed that 16.9% of children were myopic, while 19.9% were hyperopic. Various forms of astigmatism were found in 29.9% of children. (3,4). In 2023, Monika et al, analyzed the prevalence of refractive errors after cycloplegia in 8-year-old children, and found myopia prevalence of 16,80%. For the same age group, Dalz found

1,9%, and Czepita – 8,3%. These studies clearly show that prevalence of myopia increased in recent decades in Poland.

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Mieszko Lachota, MD (Poland)[1,2]

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2 Department of Clinical Immunology, Medical University of Warsaw, Warsaw, Poland

Myopia complications in children

Myopia, characterized by elongated axial length impairing distance vision, is a growing concern in the pediatric population. Due to the pathologic thinning of ocular tissues and decreased visual acuity, myopia in children can lead to a range of complications, including but not limited to refractive amblyopia, retinal detachment, and myopic macular degeneration (MMD).

Refractive amblyopia develops due to uncorrected refractive error that interferes with visual development in young children. Early diagnosis with implementing age-specific correction strategy is pivotal in preventing permanent visual impairment. Retinal detachment is another potentially devastating complication of myopia. Early surgical intervention such as scleral buckling can reduce vision loss with the extent of refractive error significantly influencing surgical outcome. MMD, a primary cause of visual impairment among myopic individuals, progresses at rates proportional to myopia severity, necessitating intensive treatment of myopia. The severity of other complications of myopia is also proportional to the degree of myopia, with highly myopic children carrying the greatest risk.

Though complications of myopia in children are less common than in adults, their potential for causing permanent visual impairment warrants regular examinations and proactive management. As the risk of these complications increases with the severity of myopia, the frequency of checkups should be proportional to the degree of myopia and presence of other comorbidities. Anti-myopia therapies coupled with behavioral.

Julia Dezor-Garus, Anna Gotz-Więckowska

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The use of the MYAH device for monitoring the progression of myopia in children

Introduction: The prevalence of myopia among children has increased worldwide. Systematic measurements of axial length elongation and cycloplegic refractive error are crucial for controlling the progression of myopia and determining treatment efficacy.

Materials and Methods: Presentation on the use of the Myah device in everyday clinical practice.

Results and Conclusions: The Myah device is a multifunctional platform that includes an optical biometer, corneal topographer, and pupilometer. Axial length measurement is performed using optical low coherence interferometry. The device incorporates percentile curves of axial length, allowing for the monitoring of myopia progression, comparison of measurements with those of children of the same age, and estimation of the patient's risk of myopia and high myopia. It also generates graphical progression reports of refractive error and axial length for the same patient. Corneal topography is measured using 24 Placido rings reflected from the anterior corneal curvature, and the device produces various types of maps, including keratoconus screening. Myah is capable of measuring pupil size under controlled lighting conditions, providing information about reaction time and pupil size aiding in low-dose atropine treatment. It also measures pupil centration and diameter across a range of light levels, facilitating the fitting of myopia-controlling lenses. The Myah device enables simulation of contact lens fitting and includes a database of conventional rigid gas permeable and orthokeratology contact lenses, aiding in the selection of the most suitable options for individual patients. Overall, the device has proven to be highly beneficial in the daily practice of monitoring children with myopia

SESSION IV

Michael Repka, MD (USA)

Johns Hopkins Medicine Home; Wilmer Eye Institute, Baltimore

Practice patterns in myopia control in USA

There has been remarkable growth in interest in myopia control in the US. No single method has universal acceptance. Increased outdoor activities (and less near screen time) are typically recommended by ophthalmologists and optometrists, but there is little information on their effectiveness among children in the US. Low-dose atropine is in common use, although not commercially available. Of note the two US studies of low-dose atropine published in 2023 have contradictory results with 0.01%, no benefit in one[1] and 0.24D slowing over three years in the other randomized clinical trial.[2] In the latter study 0.02% was not effective. Contact lenses are being used by older children and teens. There is one FDA-approved lens for myopia control (MiSight, CooperVision)[3] which slowed progression 0.73D over three years and another clinical trial using an already approved bifocal contact lens for presbyopia found myopia progression slowing by 0.46D over three years (Biofinity high add, CooperVision).[4] Combination therapy needs to be critically evaluated, but currently lacks evidence to support its use. The treatment effects of these methods have been modest. Research into more powerful methods to control axial elongation is needed.

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Rafael Iribarren, MD (Argentina)

Iribarren Eye Consultants, Buenos Aires

Practice patterns in myopia control in Argentina

Argentina is the 8th country in surface extension with only 16 subjects per square kilometer while Europe has 109 subjects per same surface. With an overall prevalence of high myopia less than 2%, myopia is the leading cause of visual disability certificate emission for people in working age population in the City of Buenos Aires after 7000 visual disability certificates were studied. By year 2000 at ARVO we came to know about atropine treatment of myopia and knowing then that a treatment to arrest progression would arise we began to study our prevalence, natural history and risk factors of myopia. Then we showed a prevalence near 30% in university populations and for the first time in the literature we showed that early onset was a risk factor for high myopia. Then we showed that more years of study led to higher amounts of myopic refractive error. And we showed that the final refractive error achieved in low and moderate cases of myopia was not related to family history of myopia. By 2005 we got to know Bill Stell and Ian Morgan and came to know about outdoor exposure.

In the last few years we added four more studies about prevalence of myopia in the region, showing 3% prevalence by age 12, and 14% prevalence in adults in a rural environment and 26% prevalence in a university student population, all in Argentina. And in Ecuador we showed a 3% prevalence in primary school aged children. One of the studies with cycloplegia in Marcos Juarez city was prospective and showed a decrease in hyperopic refractive error between ages 6 and 12 that was published showing that some kind of emmetropization is still working at those ages, a fact well known by pediatric ophthalmologists in clinical practice but still not described in emmetropization papers.

Recently, we analyzed with Carla Lanca and Abel Szeps the role of schooling a tutorial classes in myopia development in Argentina. We noticed that children even in the city of Buenos Aires spent about 27 hours per week outdoors, perhaps related to the fact that children in our country in 80% of the cases go to primary and secondary school only 4 hours per day, and spend the rest of the day in clubs or parks, with only 25% of the children being engaged in tutorial classes. In this study the age of onset was 3 years earlier in children who took tutorials of went to school 8 hours per day, showing that schooling times are important in myopia development.

During the covid confinement we did two studies leaded by Dr. Carolina Picotti, showing that the rate of progression in myopic subjects (measured under cycloplegia) was doubled the year of confinement and was increased by 30% at myopia onset in premyopic children.

During the last two years, two types of myopia control spectacles have been developed by the local industry. The preliminary results of the testing with these defocus spectacles showed that the choroid moved forward when reading with the special spectacles, showing promise of myopia control effect with these lenses produced in Argentina. These data were published in Photonics and presented in the IMC at Rotterdam in 2022. At the same time we also developed with Martin de Tomas fundus photographs obtained with an OCT machine showing clearly in which zone of the fundus of the eye these defocused images fell, for the first time in the literature.

We noticed the importance of the illumination in refractive development showing the work done in collaboration with Yuval Cohen in Israel where he stated that indoor level light environment affected refractive development in humans by age 4 to 5. And we showed how illumination varied in our local schools depending on date of construction.

Since 2018 the Argentine Myopia Study Group has developed periodic surveys about myopia control awareness in ophthalmological practice showing how it has increased. And this same group developed a consensus based on more than 50 questions about clinical practice in myopia control that was the first of its kind both in Spanish and English versions and that can be downloaded free access.

Jennifer Hyuna Kim Lee, MD (Mexico)

Instituto de Oftalmología FAP Conde de Valenciana IAP, Mexico City

Practice patterns in myopia control in Mexico

Myopia is a public health threat worldwide, with increasing prevalence in most regions over the past decades. Predictions indicate that by 2050, 50% of the population will be afflicted with myopia and 10% with high myopia.(1) A series of interviews were performed to get an expert consensus on the practical patterns in myopia control in Mexico. Limited disposable income poses a challenge for the target population to access treatment and obtain contact lenses or spectacles with highly aspherical lenslets. Therefore, commonly employed treatments consist of atropine eyedrops and environmental interventions. For children aged 4 to 7 years with

myopia, 0.05% atropine is initiated. If photophobia, blurred vision, or allergic conjunctivitis occurs, the concentration is reduced to 0.01%. Initially, myopic children aged eight years and above receive treatment with 0.05% atropine. If within a year, a ≥ 1 diopter (D) progression is measured, and the patient has ≤ -1.5 D cylinder, a dual focus contact lens combined with 0.05% atropine is offered. If the patient has > -1.5 D cylinder, dual focus contact lenses and single vision lenses are provided with the remaining cylinder correction. Whenever possible, the axial length is measured every 4 to 6 months and an annual corneal topography is recommended for patients with cylinders greater than 2 D. The follow-up is done every 3 to 6 months with cycloplegic refraction. Individualized treatment plans are tailored to each patient based on their risk factors and compliance. Future research endeavors should encompass population-based studies on myopia progression specific to the Mexican population, investigating regional and ethnic variances.

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Delivered in an online format, the conference was a great success. **674 participants from 38 countries around the world** registered for the event, i.e.: Poland (555), USA (19), Mexico (11), Ukraine (10), Hong Kong (7), Australia (6), Israel (6), Greece (5), Latvia (5), Philippines (4), India (4), Germany (4), Canada, Lithuania, United Kingdom, Argentina, Brazil, Ecuador, France, Portugal, Romania, Saudi Arabia, Belarus, Bulgaria, Chile, China, The Netherlands, Indonesia, Japan, Luxemburg, Kuwait, Norway, Cambodia, South Africa, Serbia, Morocco, Turkey, Hungary.

Doskonała Nauka

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