Original Article

A new Health Information Computer Support Tool for Doctors in Asia: Pubmed, Illustrated with Two Examples

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ABSTRACT

Background

Research, laboratory-based or clinical, is essential for development of all countries. Magnetic resonance spectroscopy (MRS) analyses small particles and is related to magnetic resonance imaging of humans. Dengue fever is an infectious disease of humans.

Objective

This investigation is based on the idea to study the role of MRS and opportunities to use the internet for clinical support in the low-income country Cambodia.

Methods

The biomedical research database PubMed was employed to quantify number of publications of MRS and dengue fever research in Laos, Cambodia, Vietnam, Thailand, Japan and United States of America (USA). Gross domestic product (GDP) and dengue fever case numbers were obtained from reference resources. Correlation analysis was used.

Results

4 MRS research publications were identified for Cambodia (minimum 0 for Laos and maximum 42602 for USA). Cambodia had a GDP of 29.96 billion USD (minimum Laos 19 billion USD and maximum USA 25462.7 billion USD).The correlation coefficient between MRS research publications and GDP was 0.9727.Cambodia had 9, Laos 0, Vietnam 16 and USA 106 dengue fever research publications. Cambodia had 12500, Laos 32364, Vietnam 361813 and USA 1188 dengue fever cases. The correlation coefficient between Dengue fever research publications and Dengue fever cases was -0.2022.

Conclusion

MRS research in Cambodia is limited. MRS research in the investigated countries in Asia and USA is related to country GDP and wealth.High numbers of country Dengue fever cases did not predict a high number of Dengue fever research publications in the studied countries. Pubmed can guide medical doctors in low-income countries with research planning of infectious diseases and other clinical questions.

Keywords

Magnetic resonance spectroscopy; Dengue fever; Cambodia; global health; low-income countries

INTRODUCTION

Research, laboratory-based or clinical, is an essential component of development and growth of all nations of the world[1].

Magnetic resonance spectroscopy (MRS) is a scientific method that is used to analyse structure of small particles [2]. The physical phenomenon that forms the basis of MRS is also applied in radiological imaging of humans (MRI or magnetic resonance imaging).

Dengue fever is a viral infection of humans and can be transmitted by mosquitoes[3].

Every year worldwide up to 400 million people acquire the infection with Dengue virus and the low-income country Cambodia in South East Asia is one of the countries affected.

The idea that forms the basis of this study is the question if low-income countries such as Cambodia conduct MRS research. Subsequently, the relationship between MRS research and wealth of a country was investigated. This was followed by an analysis of Dengue fever research in Cambodia, because Dengue fever is an important public health problem of Cambodia. Therefore, the relationship between the number of people with Dengue fever infection and the number of Dengue fever research publications in different countries was explored. The following report shows how this research activity can provide medical doctors and all clinicians of low-income countries with useful health-related information concerning the research conducted in resource-limited settings.

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Bangladesh Journal of Medical Science Vol. 25 No. 02 April'26

DOI: https://doi.org/10.3329/bjms.v25i2.88737

MATERIALS AND METHODS

The biomedical research database Pubmed (https://pubmed.ncbi.nlm.nih.gov/) was used to determine number of publications for MRS (search was conducted 25.7.23) and dengue fever (search was conducted 31.7.23) for the following countries:

Laos, Cambodia, Vietnam, Thailand, Japan and United States of America (USA).

The following search terms were used:

(country name[Affiliation]) AND (nuclear magnetic resonance spectroscopy)

(country name[Affiliation]) AND (Dengue)

Gross domestic product (GDP) is an indicator of financial wealth of a country.

The following are the GDP in 2022 for the studied countries and references that have provided the GDP values used in this investigation:

Cambodia 29.96 billion USD.

Reference:

https://www.worlddata.info/asia/cambodia/economy.php#:~:text=Worldwide%20gross%20domestic%20product%20in,104%20of%20the%20major%20economies

Website accessed 8.9.23.

Laos 19.0 billion USD.

Reference:

https://www.worldeconomics.com/GrossDomesticProduct/Real-GDP/Laos.aspx

Website accessed 8.9.23.

Vietnam 408.8 billion USD.

Reference:

https://tradingeconomics.com/vietnam/gdp

Website accessed 8.9.23.

Thailand 495.34 billion USD.

Reference:

https://tradingeconomics.com/thailand/gdp

Website accessed 8.9.23.

Japan 4230 billion USD.

Reference:

https://www.statista.com/statistics/263578/gross-domestic-product-gdp-of-japan/

Website accessed 8.9.23.

USA 25462.70 billion USD.

Reference:

https://tradingeconomics.com/united-states/gdp

Website accessed 8.9.23.

Excel 365 (Microsoft 365 for the web) was used to calculate correlation coefficients for number of publications MRS and GDP.

Total dengue fever case numbers per country in 2022 were determined.

The following are the case numbers and references that have provided the case numbers:

Cambodia 12500.

Reference:

https://english.news.cn/20230104/6b926a72dc7c4adc94162fe9a00eeb65/c.html#:~:text=PHNOM%20PENH%2C%20Jan.,health%20official%20said%20on%20Wednesday.

Website accessed 9.9.23.

Laos 32364.

Reference:

https://english.news.cn/20230105/ff7a072590d744be93e7d151de8f1ef5/c.html

Website accessed 10.9.23.

Vietnam 361813.

Reference:

https://outbreaknewstoday.com/vietnam-ends-2022-with-more-than-360000-dengue-cases-98878/

Website accessed 10.9.23.

Thailand 33489.

Reference:

https://crisis24.garda.com/alerts/2023/06/thailand-elevated-dengue-fever-activity-reported-nationwide-through-june

Website accessed 10.9.23.

Japan 300.

Reference:

https://www.frontiersin.org/articles/10.3389/fpubh.2022.959312https://www.frontiersin.org/

articles/10.3389/fpubh.2022.959312

Website accessed 10.9.23.

USA 2259.

Reference:

https://www.cdc.gov/dengue/statistics-maps/historic-data.html

Website was accessed 10.9.23.

Excel 365 was used to calculate correlation coefficients for number of dengue fever publications and Dengue fever case numbers.

RESULTS

The data collection of this study started with counting of the number of MRS research publications of the selected countries with the biomedical research database Pubmed (see Methods).

Fig-1 presents the number of MRS research publications of Laos, Cambodia, Vietnam and Thailand.

Laos had 0, Cambodia 4, Vietnam 337, and Thailand 727 MRS research publications.

The number of MRS research publications of Japan was 16783 and of USA was 42602.

GDP values (see Methods) provide general information about wealth of a country and this wealth of a country could be related to presence and extent of laboratory research using MRS.

Therefore, GDP values for the studied countries were collected from references (see Methods) and have been presented in fig-2 for Laos, Cambodia, Vietnam and Thailand for review.

GDP of Cambodia was 29.96 billion USD and of Thailand GDP was 495.34 billion USD.

GDP of Japan was 4230 billion USD and GDP of USA was 25462.70 billion USD.

Fig-1 and fig-2 suggest that there could be a correlation between research of MRS (number of publications) and wealth of a country (according to GDP). To investigate this possible correlation the correlation coefficient (See Methods) was determined and presented in fig-3.

Fig-3 also illustrates the number of MRS publications and corresponding GDP of Laos, Cambodia, Vietnam and Thailand.

The correlation coefficient was 0.9727.

Fig-4 presents the number of Dengue research publications of Laos, Cambodia, Vietnam and Thailand.

Dengue publications were counted with Pubmed (See Methods).

Laos had no Dengue fever research publications. Cambodia had 9 and Thailand had 48 Dengue fever research publications.

Japan had 5 and USA had 106 Dengue fever research publications.

The information about countries completing Dengue fever research (fig-4) introduces the question what motivation countries may have to investigate Dengue fever.

Perhaps countries severely affected by this disease may choose to investigate Dengue fever with the goal of identifying methods to avoid Dengue fever infection.

Therefore, in an effort to understand this better Dengue fever case numbers of countries were collected from references (See Methods).

Fig-5 presents the number of Dengue fever cases of Laos, Cambodia, Vietnam and Thailand.

In 2022 there were 12500 Dengue fever cases in Cambodia and 361813 cases in Vietnam. There were 300 Dengue fever cases in Japan and 1188 Dengue fever cases in USA in 2022.

In fig-6 the possibility that there is a correlation between Dengue fever research and Dengue fever case numbers in selected nations of the world was studied. Number of dengue fever research publications and dengue fever case numbers of Laos, Cambodia, Vietnam and Thailand were presented in fig-6. The correlation coefficient (See Methods) between Dengue fever research publications and Dengue fever cases was -0.2022.

DISCUSSION

Nuclear magnetic resonance (NMR) is a physical observation first discovered in 1939 by Rabi in New York and forms the scientific basis of MRS (magnetic resonance spectroscopy)[4]. Scientists utilise NMR to study small particles with MRS. NMR is also employed to investigate the human body with an imaging technique that is based on NMR, magnetic resonance imaging (MRI)[2].

All countries depend on research for development of health, economy and education. The starting point of this study was the question whether the low-income country Cambodia benefits from NMR. However, the current study does not answer this question, but useful information how clinicians can access the internet to improve clinical care has been discovered during the course of this investigation and this information will be reviewed in the following discussion.

MRS research in Cambodia (fig-1) was not extensive. Cambodia is one of the low-income countries in Asia. MRS is employed in small particle physics research with limited applications in daily life. USA and Japan had numerous MRS research publications (fig-1) and both countries are industrialised nations with extensive research activity.

We quantified the wealth of the studied countries with GDP (fig-2) and then correlated GDP with MRS research (fig-3). The calculated correlation coefficient (fig-3) indicated a positive correlation between wealth and MRS research activity.

Gonzalez et al. also found that research publications output is positively correlated with financial wealth of the studied countries[5].

Infectious diseases (e.g. Dengue fever, malaria, tuberculosis) are important current health problems in Cambodia and therefore in fig-4 we investigated Dengue fever research based on the number of Pubmed publications related to Dengue fever.

Numerous yearly Dengue fever cases (fig-5) were observed in Cambodia and even more in Vietnam (fig-5). United States and Japan had very few and a large portion of the cases in Japan and United States were likely the result of foreign travel acquired outside of Japan and the United States[6].

Correlation studies between Dengue fever research quantity and Dengue fever case number of a country did not suggest an unequivocal correlation (fig-6). USA had few Dengue fever cases but the highest number of Dengue fever research publications (fig-6).

Pubmed has been in the past used by clinicians seeking support with the management and research of infectious diseases[7]. Ballabeni and Boggio reviewed publications of a serious infectious disease in Africa, Ebola virus disease[7]. The authors noted a correlation between disease outbreaks and the amount of research conducted. However, countries with relative few cases of Ebola virus disease such as United States had a large number of research publications related to Ebola virus disease.

Gonzales et al. evaluated research publications of an infectious disease that is a major problem in Brazil, Chagas disease. The authors scrutinised research groups, number of articles and country of authors to guide research planning for clinical care questions[8].

Ramos et al. reviewed tuberculosis research publications with Pubmed. The authors observed that the number of publications increased from 1997 to 2006[9]. Countries with high tuberculosis prevalence had fewer numbers of tuberculosis research publications than countries with low tuberculosis prevalence.

The internet offers opportunities for development of low-income countries.[10,11]

Pubmed is not the only internet search engine available to medical doctors to study clinical questions while working in hospital:

Google searches for example can help doctors in Afghanistan to predict diarrhoea outbreaks. Pilsczek engaged the search engine Google to study how patients use the internet before admission to hospital[12]. The collected data were deployed to predict disease outbreaks.

CONCLUSIONS

MRS research is limited in Cambodia. MRS research in the surveyed countries in Asia and North America is related to country wealth. High numbers of country Dengue fever cases did not predict a large number of Dengue fever research publications in the studied countries. Pubmed results can support medical practitioners in low-income countries in Asia with Dengue fever research planning and with finding answers to diverse clinical questions.

Competing interests: No conflict of interests

Funding: No funding

Underlying data: All data have been provided

Author contribution

Study design, data gathering, data analysis, writing and submitting manuscript, editign and approval of final draft: Florian Pilsczek

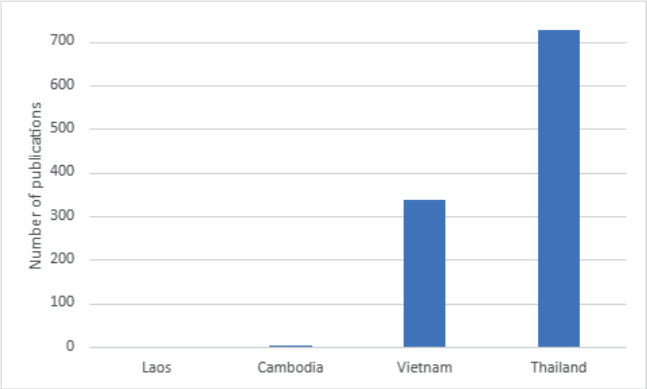

Fig-1: MRS research publications of Laos, Cambodia, Vietnam and Thailand. The x-axis presents country names (Laos, Cambodia, Vietnam and Thailand). The y-axis reports the total number of MRS research publications according to the biomedical research database Pubmed (see Methods). The number of MRS research publications of Japan was 16783 and of USA was 42602. Laos had 0, Cambodia 4, Vietnam 337, and Thailand 727 MRS research publications.

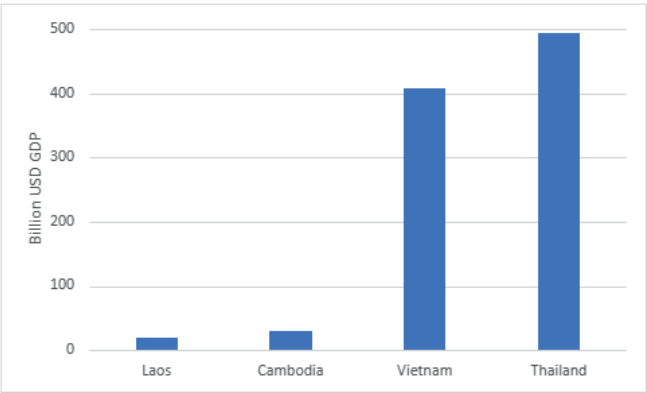

Fig-2. Gross domestic product (GDP) of Laos, Cambodia, Vietnam and Thailand. The x-axis presents country names (Laos, Cambodia, Vietnam and Thailand). The y-axis reports the GDP as collected from references (see Methods). GDP of Cambodia was 29.96 billion USD and of Thailand GDP was 495.34 billion USD. GDP of Japan was 4230 billion USD and GDP of USA was 25462.70 billion USD.

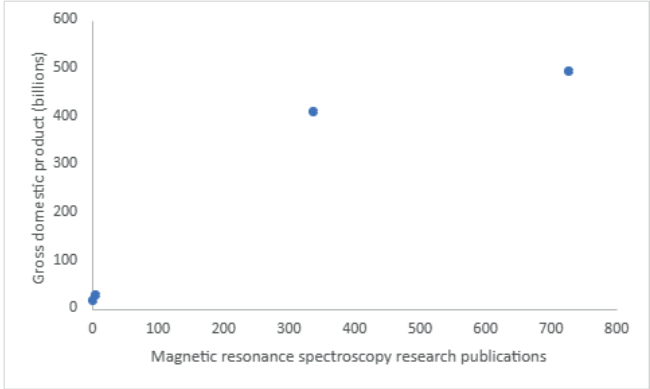

Fig-3. Correlation between number of MRS publications (x-axis) and gross domestic product (GDP) (y-axis) of Laos, Cambodia, Vietnam and Thailand. The correlation coefficient was (see Methods, Japan and USA were included): 0.9727.

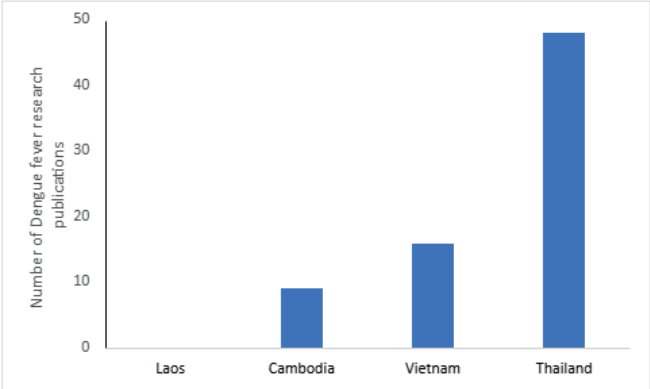

Fig-4. Number of Dengue fever research publications of Laos, Cambodia, Vietnam and Thailand. The x-axis presents country names (Laos, Cambodia, Vietnam and Thailand). The y-axis reports the total number of Dengue fever research publications according to the biomedical research database Pubmed (see Methods). Laos had no Dengue fever research publications. Cambodia had 9 and Thailand had 48 Dengue fever research publications. Japan had 5 and USA had 106 Dengue fever research publications.

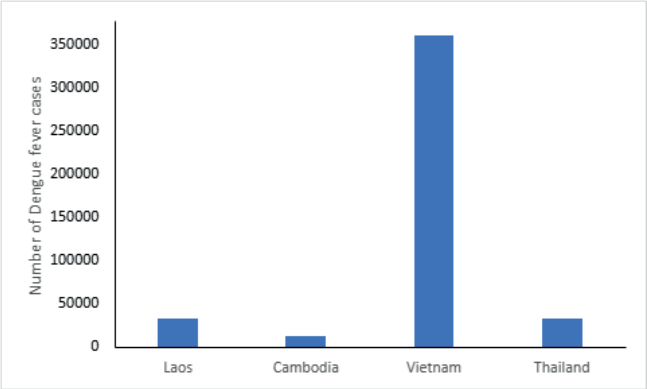

Fig-5. Number of Dengue fever cases of Laos, Cambodia, Vietnam and Thailand in 2022. The x-axis presents country names (Laos, Cambodia, Vietnam and Thailand). The y-axis reports Dengue fever case numbers collected from references (see Methods). In 2022 there were 12500 Dengue fever cases in Cambodia and 361813 cases in Vietnam. There were 300 Dengue fever cases in Japan and 1188 Dengue fever cases in USA.

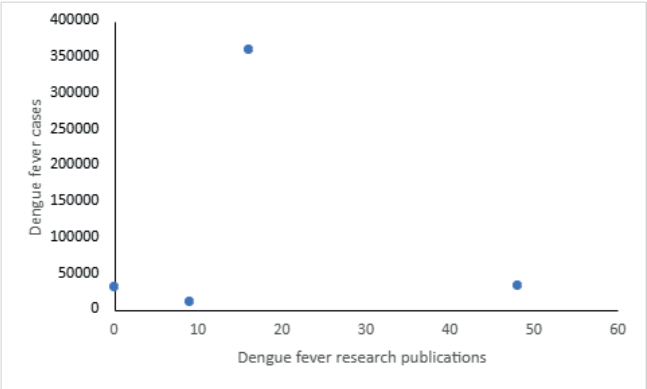

Fig-6. Correlation between number of Dengue fever publications (x-axis) and number of Dengue fever cases (y-axis) of Laos, Cambodia, Vietnam and Thailand. The correlation coefficient was (see Methods): -0.2022.

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