REVIEW ARTICLE

Traditional educational program of human or medical parasitology

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ABSTRACT

The teaching of human parasitology is essential for students of health sciences, especially medicine, because it is a major global public health problem—occurring with high frequency in low-income countries—and because of its presence in countries considered developed. In this sense, it is estimated that worldwide there are 2,800 million individuals infected with soil-transmitted helminths, 20 to 30% people infected with *Toxoplasma gondii*, 300 to 500 million new cases of malaria per year, and nearly 15 million Latin Americans with Chagas disease, an infection caused by *Trypanosoma cruzi*.

This narrative review article analyzes information available in digital repositories on aspects of the traditional educational program of human or medical parasitology using descriptors or keywords closely related to the topic. The reviewed articles were mainly those published in peer-reviewed, indexed and prestigious scientific journals. Moreover, the traditional program of parasitology and the prevailing pedagogy are described with the purpose of encouraging discussion on the methods that lead to its learning. Also, given the dynamic nature of this process and the constant challenges that must be faced in this field, said information can help to explore new ways of teaching parasitology in answer to the demands of the context.

In conclusion, parasitic diseases have affected humankind throughout history, causing illness, disability and death in millions of people. Therefore, among the measures to fight such a terrible scourge, the training of more and better professionals in the area is promoted due to their leading role in the design and execution of control programs. As a result, the need to describe in detail the characteristics of the traditional teaching of this branch of knowledge arises—as shown in this paper—in view of the new human teaching methods: participatory learning, problem-based learning and Internet-assisted learning.

Keywords: Parasitology; Teaching; Curriculum; Program (Source: MeSH NLM).

INTRODUCTION

Parasitic diseases are considered a public health problem worldwide. It is estimated that Chagas disease affects between 8 to 12 million people in Latin America; in 2020, there were 241 million cases of malaria worldwide, resulting in 627,000 deaths; in the Americas, 120 million people live in areas at risk of infection.

It is estimated that Chagas disease affects between 8 to 12 million people in Latin America. In 2020, there were 241 million cases of malaria worldwide, resulting in 627,000 deaths. In the Americas, 120 million people live in areas at risk of infection. Furthermore, toxoplasmosis affects one-third of the population worldwide, and *Toxoplasma gondii* is considered to be a significant opportunistic brain pathogen. All these parasitic pathologies have a high prevalence in countries in continents traditionally considered to have low to middle income (such as in Africa, Asia and the central and southern region of the American continent) and a low prevalence in high-income countries. Despite this situation, there is little interest in training in this branch of knowledge, and there is a delay in the development of pedagogical tools for teaching it [1-8].

In general terms, in parasitology, the teaching-learning

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process is not active, but rather focuses on the teacher or on the content instead of the student; it is not a process that stimulates teamwork or the solving of real-life problems. The new pedagogical methodologies confer a leading role to the student in the challenge of learning; however, to successfully face these changes, the traditional way of teaching parasitology must be fully understood. Success, i.e., the training of high-quality professionals, is only possible through the interaction between the new teaching-learning processes and the existing one [9-11].

Therefore, the objective of this narrative review aims, first, to show the characteristics of the traditional program of human parasitology and, second, to describe the noteworthy attributes that characterize the traditional pedagogy of this subject in the curricula of most Latin American health sciences programs. This aims to stimulate the debate on the processes that lead to learning, the integration of knowledge, the promotion of the development of complex mental skills resulting from meaningful global tasks and the resolution of health problems based on critical judgment and analysis [9,10,12-19].

SEARCH STRATEGY

This paper, a narrative documentary review, was sourced from information available from digital repositories on aspects of the traditional pedagogical program of human or medical parasitology, using descriptors or keywords closely related to the topic. The articles reviewed were mainly those published in peer-reviewed, indexed and prestigious scientific journals. Duplicate papers and those without clear or original conclusions were excluded. All original documents published up to April 2023 were included. The analysis of the relevant ideas allowed grouping them into three subchapters in the results section: traditional program of human or medical parasitology, traditional pedagogy in parasitology, and conclusions, in order to facilitate readability.

Traditional educational program of human or medical parasitology

Human parasitology has its basis in biology, physiology, biochemistry, human anatomy, embryology, immunology and pathology. Its training program is designed to provide, through one or various groups of professors in one or more courses, knowledge of parasitic diseases, so that the future professional may be able to suspect, diagnose, treat and prevent these diseases according to the predominant cases in each particular region. Teaching has focused specifically on the natural history of parasitosis, i.e., the morphological, biological and ecological bases that govern the relationship between parasites, transmitters and hosts; on the elements of human and animal biology and ecology related to parasitosis; and on the epidemiological characteristics, including incidence, prevalence, geographical distribution, morbidity, mortality, magnitude, significance, vulnerability and transmission mechanisms [20-24].

Moreover, the teaching of parasitology also includes parasite-host relationships, pathogenesis and direct effects of parasites on the host, clinical signs and symptoms, diagnostic methods (e.g., how to obtain the sample, laboratory procedure and interpretation of results), specific treatment for each type of parasitosis, prevention, individual and collective control, existing governmental health programs aimed at addressing these diseases and raising students' awareness of the importance of studying these diseases in order to deal with the health issues faced by the population they will serve. All this is structured in two sections: the first focuses on general concepts, and the second on special aspects. The aim is to reveal the basic mechanisms related to the prevalence and control or eradication of parasitic diseases or to explain the relationships between parasites and human beings or the external environment [20,24].

Although parasitology, as a subject, is included in the curriculum of health sciences programs. Many of its aspects are taught within the programs of other subjects, which are taught by teachers without adequate training in this field, without diagnostic expertise and with little research on the topic, but with the strong desire to contribute to the comprehensive professional training of health sciences students. The parasitologist has the responsibility of integrating parasitology throughout the curriculum; however, many obstacles have arisen, and there has been limited success. It is challenging to unify the teaching activity and healthcare practice provided in the internal medicine, pathology, surgery, and pediatrics services as well as in the departments of preventive and social medicine. Although preventive and social medicine positively supports health promotion and prevention of parasitic diseases, there are few technical tools based on the content of the parasitology program [20,24].

Added to this is the fact that in some countries, parasitology is integrated with other basic sciences, such as microbiology and immunology, without being considered a core and fundamental course in study plans and programs, to the point of being elective for some healthcare professions. The teaching of parasitology is more specialized and compulsory in high-income countries, where parasitic diseases have a lower prevalence compared to low-income countries. This disparity is due to the weak allocation of resources for higher education in low-income countries. However, it is worth noting that this situation could be reversed with increases in government investment in education and healthcare [20,25-31].

It is recognized that parasitic diseases are closely linked

to the environment and the social setting in which humans live, a relationship characterized by complexity and constant change, for which the current parasitology training programs are not prepared. This is another weakness of the curricula that adds to those already mentioned. It should be noted that the implementation of parasitology teaching has focused on lectures that highlight the aspects of most interest and new knowledge, laboratory practices to facilitate understanding and fixation of concepts, discussions of clinical and pathological cases (or situational learning method that stimulates active student participation in class with a positive effect on the educational process), field visits or excursions (to the environment and social setting where transmission occurs), student presentations of seminars, and master classes taught by subject professors or guest speakers. In all these pedagogical strategies, care is taken to ensure academic quality, aiming to efficiently contributing to the student's professional training [20,25,32].

It should be pointed out that the abovementioned teaching methods of clinical parasitology are currently based, if rightly so, on multimedia teaching, where the projection of images and videos is the key to increasing student interest in learning. However, with this method, the ability for logical thinking may be compromised due to its adverse effect on student concentration, as they consider this subject and its topics to be tedious and monotonous, making it difficult to memorize what they learn [32].

Generally, multimedia tools are used, with little additional writing on the classroom board, which contains a large number of photographic images of parasites and patients. Practical teaching includes laboratory demonstrations (morphological aspects to demonstrate the parasite shape and structures and pathological aspects to explain the characteristics of parasitic diseases) and experiments. In addition, evaluations are conducted mainly focused on oral or written measurement of technical knowledge, with identification and analysis of clinical cases including multiple-choice, true-false or fill-in-the-blank questions. The content is distributed into what the student should master on the topic (75 %-85 %), student familiarization with the topic (10 %-15 %) and self-learning, understood as the active training process or student involvement in knowledge acquisition (5 %) [20,25].

Hence, in some countries, mainly in Asia, heuristic teaching is promoted, based on inquiry, discussion and active participation, with particular emphasis on microteaching and group teaching, as it is believed to improve communication and teamwork. In this regard, some Asian universities employ hybrid both online and offline teaching, the latter focused on case-based learning (creating blogs and thematic discussion forums) [32].

Rapid internalization of knowledge and improvement of practical problem-solving skills are attributes of the study of clinical cases because they link theory with practice and promote research, analytical thinking, communication, discussion and problem solving, based on autonomous learning. This requires continuous updating of knowledge on the part of the teacher and the student, progression from passive to active learning as well as proactivity and creativity [32].

Traditional pedagogy in parasitology

Traditional pedagogy, although applied to the teaching of parasitology since it gained the status of a science, is not a strategy exclusive to it. Unfortunately, it neglects the mechanisms involved in the learning process and is limited to modeling knowledge and skills empirically acquired by students. Furthermore, information is received by students in the form of discourse with minimal practical workload due to financial, infrastructure and equipment deficiencies. Information is retained through the mechanical repetition of systematic exercises and memorization, while evaluation is reproductive, primarily aimed at measuring knowledge without including analytical and reasoning skills [28-41].

Traditional pedagogy proves insufficient both in the theoretical-cognitive and practical aspects of parasitology, since it is affected by the decrease in the number of hours dedicated to its teaching, resulting in a worrying reduction in the capacity of health sciences professionals to diagnose parasitic diseases because they do not consider them important. In this model, the teacher holds authority over the student (paternalistic-cognitive model), with a clear tendency to imposition, coercion and limited flexibility since the student is considered as a simple receiver of information, with complete disconnection from the processes involved in the assimilation of knowledge and the internal human structure that determines individual and social behavior, and the influence that this can have on learning. Hence, it is essential to strengthen constructive learning because parasitology is a science within the biology of pathogens in constant change in its body of knowledge, as well as being inextricably influenced by the environment and social setting [28,34,44-49].

CONCLUSIONS

Parasitic diseases have affected humankind throughout history, and even today parasites continue to cause illness, disability and death in millions of people around the world. Therefore, among the measures to fight such terrible scourge, the importance of training more and better professionals in the area is promoted due to their leading role in the design and execution of control programs. As a result, the need to describe in detail the characteristics of the traditional teaching of this branch of knowledge arises.

Thus, it would be possible to demonstrate its benefits and drawbacks—in view of the new human teaching methods: participatory learning, problem-based learning and computer (internet)-assisted learning.

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