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Knowledge disparities in the approach to rickettsiosis: a comparative study among medical students from endemic and non-endemic regions of Mexico

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KEYWORDS
Tick-borne diseases;
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Abstract
Introduction: The approach of rickettsioses and other vector-borne diseases can pose challenges due to the clinical similarity these diseases share with other infectious conditions. The knowledge acquired in medical school is essential for properly addressing, with a good attitude and confidence, patients who may be suffering from these diseases.
Methodology: This study involved a cross-sectional survey of 144 medical students from endemic and non-endemic areas in Mexico. Descriptive statistics and comparisons of the groups were made based on their residence in endemic versus non-endemic regions. Logistic regression was performed to identify the association between knowledge, attitudes, and confidence based on place of residence using Stata 14.
Results: Among the students, 53.4% live in an endemic region, and they exhibited a higher level of knowledge about the vector, symptoms, and preventive measures compared to those from non-endemic areas.
Conclusion: Students from endemic regions exhibited more confidence and knowledge on rickettsiosis.

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PALABRAS CLAVE
Enfermedades por Picaduras de Garrapatas;
Estudiantes de Medicina;
Conocimientos

Variación en el conocimiento sobre el abordaje de la rickettsiosis entre los estudiantes de medicina de regiones endémicas y no endémicas de México

Resumen
Introducción: El abordaje de las rickettsiosis y otras enfermedades transmitidas por vectores puede plantear desafíos debido a la similitud clínica que estas enfermedades comparten con otras afecciones. Los conocimientos adquiridos en la facultad de medicina son fundamentales para abordar adecuadamente, con buena actitud y confianza, a los pacientes que puedan estar padeciendo estas enfermedades.
Metodología: Este estudio involucró una encuesta transversal a 144 estudiantes de medicina de áreas endémicas y no endémicas en México. Se realizaron estadísticas descriptivas y comparaciones de los grupos en función de su residencia en regiones endémicas versus no endémicas. Se realizó una regresión logística para asociar actitudes y confianza según el lugar de residencia utilizando Stata 14.
Resultados: El 53.4% de los estudiantes vive en una región endémica y presentó un mayor nivel de conocimiento sobre el vector, síntomas y prevención.
Conclusión: Los estudiantes de regiones endémicas mostraron mayor confianza y conocimiento sobre la rickettsiosis.

Introduction

An appropriate medical diagnosis is commonly guided by clinical and epidemiological evidence and experience. Anamnesis is fundamental to identifying causes and risks for rickettsiosis. Ticks, mosquitoes, and other vectors may coexist in neglected regions, and they may be related to unspecific signs and symptoms.[1] Medical education programs in Mexico, as in other countries, may or may not include content on diagnosing specific communicable diseases, including vector-borne diseases. In certain medical programs, vector-borne diseases may be elective courses with variable durations. Programs in geographical areas where vector-borne diseases are of epidemiological importance are more likely to offer these courses, and medical students there will enroll in these elective courses more frequently. Given the mobility of physicians across Mexico, which is a very diverse country with endemic areas in the tropics and non-endemic areas in the center, it may not be uncommon for untrained physicians to, at some point, provide medical services in places that are endemic to vector-borne diseases including rickettsiosis (Rocky Mountain fever, typhus, etc.) and other tick-borne diseases.[2] Therefore, it is important to evaluate if there are any differences in knowledge, attitudes, and perceived risks between medical students attending faculties located in endemic and non-endemic areas for tick-borne diseases. The objective of the present study was to evaluate the differences between medical students from endemic and non-endemic areas in Mexico with respect to (a) knowledge about preventing and diagnosing rickettsiosis, (b) personal experience assisting patients with a probable diagnosis, and (c) confidence in establishing a diagnosis of rickettsiosis.

Materials and methods

A cross-sectional survey was conducted during a six-week medical rotation program in a highly specialized hospital in an endemic area for tick-borne diseases including rickettsiosis. A total of 144 students from seven different universities across the country, all undergraduates in the second year of clinical rotations, participated. This sample size was calculated for two-proportion comparisons with a 95% confidence level ($p < 0.05$). The students were invited to complete a 30-item instrument that was previously validated by Lugo-Caballero et al., with a Cronbach's alpha of 0.83 for vector-borne diseases.[3] Knowledge was established as a dichotomous variable for every response (with a value of 1 indicating a correct response), while perceived confidence was measured as an ordinal variable using a Likert scale ranging from not confident to very confident. Attitudes regarding risk assessment and risk for vector-borne diseases were given a value of 1 for a positive attitude and 0 for a negative attitude. Statistical analysis: Descriptive statistics were calculated, including frequency, percentages (for categorical and ordinal variables), and mean values with standard deviations (for numerical variables). Group proportion comparisons and two-group comparison tests were performed for the nominal and numerical data, respectively. Logistic regression was performed to test associations between groups (reported as odds ratios). Stata 12 was used for statistical analyses.

Results

From the 144 participating students, 50% were male and aged 24.2 years on average; 46.5% (67/144) were students from non-endemic regions, while 53.4% (77/144) resided in

Table 1 Confidence, knowledge and attitudes of medical students from endemic and non-endemic areas.

	Total (n = 144)	Endemic (n = 77)	Non-endemic (n = 67)	p value
Age	24.1 ± 3.1	25.7 ± 1.2	22.2 ± 3.7	0.00
Male	50%	45%	55%	0.242
How confident do you feel about…				
Rickettsiosis knowledge	79%	100%	56%	0.087
Correct diagnosis	59%	61%	56%	0.598
Trained to diagnose and treat	29%	42%	15%	0.000
Attitudes				
Health Problem	93%	100%	93%	0.000
Use of Clinical guidelines	57%	80%	31%	0.000
Correct knowledge about				
Implicated vector	70%	80%	58%	0.003
Cycle transmission	20%	19%	22%	0.668
How to establish a confirmed case	43%	59%	23%	0.000
How determine a suspected case	75%	100%	47%	0.000
Identify correct treatment	54%	61%	47%	0.110
Identify treatment in children	47%	59%	34%	0.002
Signs and Symptoms	98%	100%	97%	0.126
Lethality	75%	80%	68%	0.101
Differential Diagnosis	82%	100%	62%	0.000
Preventive practices	91%	100%	82%	0.000

endemic regions. The students from endemic regions had more knowledge about the vector, transmission, prevention, and risks of rickettsial infections; however, they had less confidence compared to students from non-endemic areas (17% vs. 19%). Only 15% of the students from non-endemic areas were trained to diagnose and treat rickettsiosis compared to 47% of those from endemic regions (p = 0.000) (Table 1). The students from endemic regions were more likely to correctly consider rickettsiosis (odds ratio = 1.34) during differential diagnosis, to revise specific protocols and guidelines (odds ratio = 2.74), were more confident of their diagnostic capacity (odds ratio = 1.49), and more likely to consider themselves well trained (20.77%) and to appropriately indicate the clinical diagnosis and confirm it using the appropriate tests (Table 2).

Discussion

A proper approach to treating vector-borne diseases is essential for first-contact general practitioners and family physicians. However, the awareness of these communicable conditions may vary between undergraduate medical doctors with different past experiences and training. One study suggested that in endemic areas of Africa, knowledge about VBD prevention is limited in non-endemic areas and the willingness to participate in courses related to VBDs is lower.[4] It is likely that students who have had previous contact through family, friends, and neighbors, as happens in endemic areas, have more knowledge about VBDs and their impact on society[5]; however, experience cannot be the only source of knowledge, otherwise misdiagnosis and

Table 2 Association between perceived confidence, knowledge and attitude between students from endemic a non-endemic areas.

	Odds Ratio	z	*p*	95% Confidence Interval	
Age	1.41	2.85	0.004	1.11	1.79
Gender (male)	1	−0.01	0.995	0.3	3.28
Confident about knowledge	0.34	−1.38	0.168	0.08	1.57
Considering differential diagnosis	0.11	−2.64	0.008	0.02	0.56
Select correct diagnostic tests	2.6	1.13	0.26	0.49	13.72
Establish a correct diagnosis	1.49	0.64	0.524	0.43	5.14
Does not feel confident	0.13	−1.22	0.221	0.01	3.41
Use of clinical guidelines	2.74	1.3	0.195	0.6	12.64
Confident to diagnose and treat	20.77	3.03	0.002	2.91	148.04
Average score	1.64	2.79	0.005	1.16	2.33

hesitancy could end up affecting patients. Physicians should remain updated through continuous education programs,[6] but there is still a need to standardize academic programs and evaluate their correct implementation.

Infectious diseases are generally included in academic programs of every medical school, but the contents may vary across Mexico as accredited schools and faculties may have different programs. Accreditation of schools and faculties of medicine is provided to applicant schools and faculties that have at least one generation of graduated students and have evidence of process and program compliance through documentation and in situ visits. Nationwide, there are 170 schools and faculties of medicine, of which only 58% are accredited, which may affect the uniformity of academic programs. Additionally, in 2020, new medicine programs were established. In these community medicine programs, which have not yet been evaluated for accreditation, most of the course contents were still being developed up until 2024.[7]

The students scored better in prevention than in diagnosis or treatment; in some cases, they did so without fully understanding the transmission cycle. It may seem that all these aspects are interconnected, but what we found could be explained by the fact that primary prevention involves hygiene and sanitation measures, which are common to various zoonotic and vector-borne diseases and are therefore independently learned.[8]

Conclusion

Our study demonstrates that medical students from rickettsiosis-endemic regions in Mexico possess significantly greater knowledge and confidence regarding the prevention, diagnosis, and treatment of this disease compared to their counterparts from non-endemic areas. This disparity in knowledge, while expected due to local exposure, highlights a critical gap in medical education.

These findings underscore the urgent need to standardize and enhance medical curricula nationwide. Specifically, we recommend integrating region-specific case studies and comprehensive modules on rickettsiosis into national medical school programs. Bridging these knowledge gaps is essential not only for equipping future physicians with the necessary tools to address vector-borne diseases effectively but also to mitigate the potential for misdiagnosis, delayed treatment, and adverse patient outcomes, especially as physicians may practice in diverse epidemiological settings. Ultimately, a more uniform and robust education in infectious diseases like rickettsiosis will contribute directly to improving patient care and strengthening public health responses across Mexico.

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Ethics committee that approved the research is the institutional Board of Ethics, which is Conbioetica approved.

Conflict of interest

Authors declare no conflict of interest within this submission.

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