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Research Article

Encounters and Management of Parasitic Diseases and Snakebites, and Attitudes Toward Parasitology Education Among Post-intern Medical Graduates of the University of Peradeniya, Sri Lanka.

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Abstract

Introduction Parasitic diseases and snakebites cause major adverse impacts on health, especially in tropical countries like Sri Lanka.

Objectives We described the encounters and management of parasitic diseases and snakebites among post-intern medical graduates at the University of Peradeniya, Sri Lanka and assessed their attitudes towards parasitology education and its impact on disease management.

Methods A descriptive, cross-sectional study recruited three consecutive batches of post-intern graduates. A census of the total study population was undertaken. Data was collected using an online, self-administered questionnaire. Descriptive statistics were computed.

Results Two hundred and three post-intern doctors from 56 hospitals in 8 provinces of Sri Lanka took part. The response rate was 33.3%. Most were females (53.2%) between the ages of 27 to 33 years. Scabies (90.1%), insect bites and stings (79.8%) and head lice (68%) were the most encountered diseases, while intestinal cestodes (8.4%), trichomoniasis (9.4%), and visceral larva migrans (9.9%) were the least encountered. Ninety-eight percent encountered snake bite cases during their internship and post-internship. The most snake bite cases were encountered in Sabaragamuwa, Uva and North Central provinces. Nearly two-thirds self-reported to be competent in managing parasitic diseases. Ninety-three percent were able to recognize the offending snake, and the live or dead snake being brought to the hospital was the commonest identification method (77.4%). Seventy-seven percent had also administered antivenom. A majority agreed that the curriculum helped manage both parasitic diseases and snakebites. Several themes emerged from participants' recommendations.

Conclusion Parasitic diseases and snakebites are commonly encountered during the internship and post-intern period. Overall, post-intern doctors have a positive attitude toward parasitology education and its impact on disease management.

Keywords: Neglected tropical diseases, epidemiology, medical education, South Asia

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Introduction

Parasitic diseases and snakebites are two significant public health challenges in the world. In 2019, there were 45 million disability-adjusted life years (DALYs) attributed to parasitic aetiologies [1]. The majority of that burden is shared by the low- and middle-income countries (LMICs). Globally, there are 421000 estimated envenoming and 20000 estimated deaths each year due to snakebites. South Asia has the highest morbidity and mortality for snake envenoming [2].

Due to its free healthcare policy and well-established public health system, Sri Lanka has fared better than most of its regional counterparts in controlling parasitic diseases. The national prevalence of parasitic diseases like soil-transmitted helminthiases has drastically reduced, while other vector-borne diseases like malaria and filariasis have been endogenously eliminated [3]. Nevertheless, the risk of reintroduction of malaria, emerging infections like cutaneous leishmaniasis and endemicity of helminthiases in high-risk regions emphasize the need for continued surveillance. Epidemiological assessments in Sri Lanka have seldom captured the burden of different parasitic diseases within a single study. Outlining the common challenges interns face in managing parasitic diseases will also help strengthen Sri Lanka's public health response to infectious diseases.

According to the 2021 Indoor Morbidity and Mortality Report, there were 24997 inward admissions due to snakebites and 56 inward deaths [4]. Since most of the patients with snakebites seek help from Western medical practice [5], the encounters by allopathic doctors have been used in the literature as a proxy for the burden of snakebites in the country [6]. Updated evidence about snake identification and antivenom administration in Sri Lanka will also have key implications for health training.

Intern doctors in Sri Lanka encounter most patients visiting secondary and tertiary care hospitals. Post-internship is the period that comes immediately after their internship when most of them can reliably recall the internship experience. Post-intern medical graduates of the University of Peradeniya are stationed across different regions in Sri Lanka. Therefore, their encounters with parasitic diseases and snakebites were considered a valid reflection of the burden of these diseases in Sri Lanka, subject to significant limitations.

Parasitology education sets the cornerstone for efficient diagnosis and management of parasitic diseases. The undergraduate parasitology curriculum taught by the Department of Parasitology at the University of Peradeniya provides basic and applicational knowledge on micro- and macro-parasitic agents. In addition to teaching about parasites, the curriculum also delivers education on snakes of medical importance in Sri Lanka. Assessing the attitudes of the trained graduates on parasitology education can guide necessary revisions in the medical education of Sri Lanka and similar LMICs.

Therefore, this study aimed to describe the encounters and management of parasitic diseases and snakebites among post-intern medical graduates at the University of Peradeniya and assess their attitudes towards parasitology education and its impact on disease management.

Methods

Study design and population

This descriptive, cross-sectional study was conducted among post-intern medical graduates from three consecutive batches, namely 2010/11, 2011/11 and 2012/13, of the Faculty of Medicine, University of Peradeniya. Medical graduates who completed their MBBS programme and the one-year internship period and were currently stationed in their post-intern appointments were eligible to participate in the study. A census of the total study population was undertaken by inviting all the graduates from the above batches to participate in the survey.

Study instruments and data collection

Data was collected from September to December 2021 as a standard online survey using Google Forms. A structured, pre-tested, self-administered questionnaire in English was used. It covered participant characteristics, type of parasitic diseases, number of snakebite cases encountered, practices and challenges in management, and parasitology education. Items were designed by reviewing the local literature. The content validity of the questionnaire was assessed by an independent panel comprising a parasitologist, a community physician, and a paediatrician, and recommended modifications were made.

During data collection, the investigators initially approached several representatives from each batch. The link to the Google form was shared on the leading social media networks of each batch (Whatsapp, Viber and Facebook) through these representatives. This exercise was repeated several times during the study period, reminding the participants to complete the online survey.

Data analysis

Data entered on Google Forms were extracted as spreadsheets via Microsoft Office Excel (version 2203). After cleaning missing and incomplete records, data analysis was performed using Statistical Package for Social Sciences (SPSS Version 25.0). Continuous variables were described using mean, standard deviation or range. Categorical variables were described using percentages. Data visualization was done using bar charts and tables. Responses to open-ended questions underwent a thematic analysis.

Ethical considerations

Ethical clearance was obtained from the Ethical Review Committee of the Faculty of Medicine, University of Peradeniya (ERC Number: 2021/EC/68). Informed consent was obtained from all participants using the same Google form. All identifiable information of the participants was anonymized during the data analysis.

Results

Study participants

A total of 203 participants responded (the response rate of the census was 33.6%). The majority were females (108, 53.2%). Participants' ages ranged from 27 to 33 years. Most belonged to the 2010/11 academic year (107, 52.7%). Post-intern doctors who completed their internship at 56 hospitals across eight provinces (except the Northern Province) in Sri Lanka participated in the study. The majority had been stationed in hospitals in the Central Province (73, 36.5%) during their internship, followed by the Western (37, 18.5%) and Sabaragamuwa (29, 14.5%) provinces. The lowest representation was from the Eastern province (7, 3.5%). Ninety-nine (48%) had worked in either national or teaching hospitals during the internship, while 31.5% (64) had been in provincial or district general hospitals. Only 18.5% (37) had served as interns at base hospitals.

Encounters of parasitic diseases

The participants encountered all 16 parasitic diseases investigated in the study. Among specific infections that were not listed in the study, monkey tapeworm infection (*Bertiella studeri*) (2) and amoebic abscess (2) were encountered by post-intern doctors.

As shown in Figure 1, the diseases most encountered by post-intern doctors were scabies (*Sarcoptes scabiei*) (183, 90.1%), followed by insect bites and stings (162, 79.8%) and head lice (*Pediculosis capitis*) (138, 68%). Intestinal cestodes were the least encountered parasitic disease (17, 8.4%). This was preceded by trichomoniasis (19, 9.4%) and visceral larva migrans (20, 9.9%).

The highest encounter of scabies was observed among the post-intern doctors stationed in the Eastern province (7, 100%), followed by the Central (67, 91.8%) and Sabaragamuwa (26, 89.7%) provinces. The highest encounter of insect bites and stings was among the participants stationed in the North Central province (9, 100%), followed by the Uva (10, 90.9%) and Central (64, 87.7%) provinces. The highest encounter of head lice was seen among the doctors working in the Southern province (12, 80.0%), followed by the North Western (15, 78.9%) and Uva (8, 72.7%) provinces. The least encountered parasitic diseases of intestinal cestodes, trichomoniasis and visceral larva migrans were reported most among participants stationed in the North Central (2, 22.2%), North Central (2, 22.2%) and Eastern provinces (2, 28.6%), respectively.

Encounters of snakebites

Almost all the post-intern doctors (199, 98%) encountered snake bites during their internship and post-intern period. Most participants (80, 39.9%) had encountered 1 to 10 snakebites, whereas 21.6% (43) had managed over 30 snakebites during this period. 63.7 % of the doctors (7) who were stationed in the Uva province, 34.4% (10) in Sabaragamuwa province and 33.3% (3) in the North Central province had encountered over 30 cases of snakebites. Meanwhile, the percentage of those employed in the Southern and Eastern provinces who had encountered over 30 cases of snakebites was less than 10%.

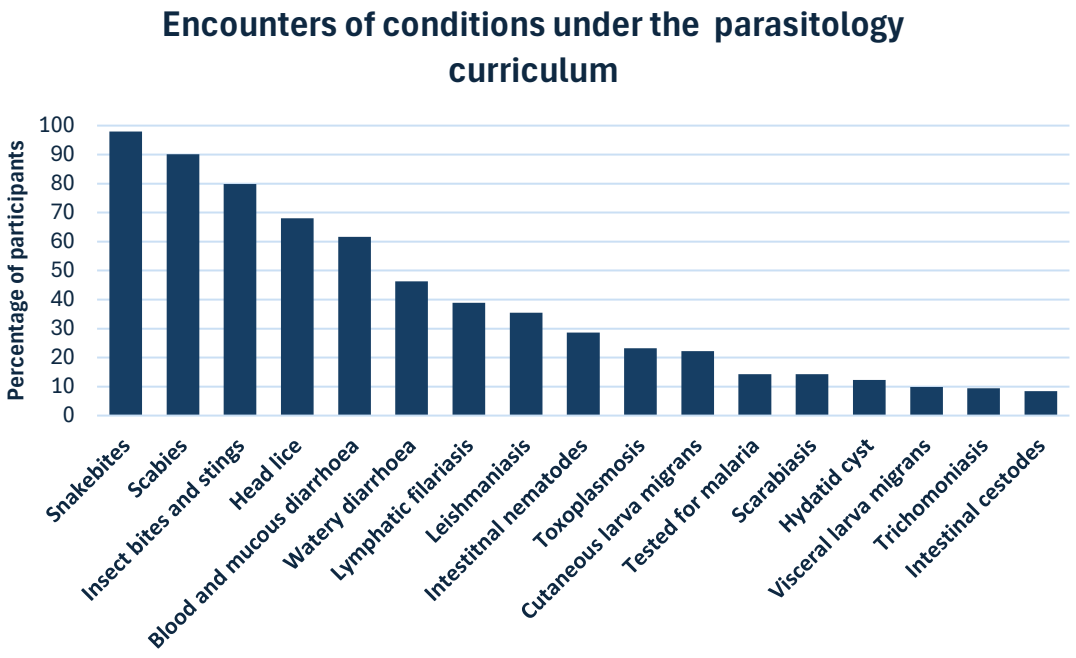

Figure 1. Encounters of conditions under the parasitology curriculum

Management of parasitic diseases

Only 58.9% (116) of post-intern doctors reported being competent in diagnosing and treating parasitic diseases. Most (144, 70.9%) admitted that they had faced difficulties during the management of parasitic diseases. Table 1 outlines the common types of difficulties faced. Among other difficulties, participants reported challenges in remembering the exact dose, frequency and regimes of treatment due to limited encounters, different clinical practices by consultants in treating the same parasitic diseases and issues in patient follow-up, for example, in deciding the follow-up duration for toxoplasmosis or toxocariasis. A large majority (182, 90.1%) had not been involved in making a referral to a consultant parasitologist during their years of service as an intern or a post-intern.

Management of snakebites

Most post-intern doctors (185, 93.0%) have been able to recognize the snake responsible for the bite. The commonest identification method has been observing the live or dead snake brought to the hospital during admission (154, 77.4%). Thirty-six (18%) identified the snake based on its clinical features. The majority (153, 77.9%) had experience administering antivenom during their internship or post-intern period. Among them, 54.8% (109) have administered antivenom on 1 to 5 occasions during these years, whereas 14.1% (28) have administered antivenom on over 10 occasions. The highest proportion of doctors who have administered antivenom over 10 occasions were stationed at Sabaragamuwa (8, 27.6%), Uva (3, 27.3%), North Central (2, 22.2%) and North Western (4, 21.1%) provinces.

Table 1. Types of difficulties encountered in managing parasitic diseases

Type of difficulty	Count	Percentage (n=167)
Lack of experience in managing patients with parasitic diseases	124	74.3%
Lack of facilities or equipment for investigating parasitic diseases	85	50.9%
Unavailability of a consultant parasitologist to make referrals	65	38.9%
Lack of knowledge in managing patients with parasitic diseases	45	26.9%
Lack of treatment options for parasitic diseases	42	25.1%

Parasitology education

Regarding the parasitology education received, 69.2% (139) and 70.3% (140) of participants agreed that the parasitology curriculum at the Faculty of Medicine, University of Peradeniya, helped to diagnose and manage parasitic diseases and snakebites, respectively. Considering the areas to be taught more extensively in undergraduate parasitology education, 89.9% (182) thought of clinical diagnosis, 56.7% (115) considered parasitological treatments, 43.3% (87) agreed on investigations, and only 0.5% (1) mentioned the referral process. Hundred and seventy-four (87%) believed having separate discussions on managing parasitic diseases in the fifth year of medical training would be helpful. Moreover, 95.5% (190) thought that a webinar to refresh the knowledge of post-intern doctors on parasitology would support optimal patient care.

Several themes emerged from the open-ended suggestions to improve the parasitology curriculum for better patient care. Making the teaching more clinically oriented was the commonest theme. This included recommendations to increase clinical case scenarios in lectures and to incorporate more case-based discussions. The next evident theme was prioritizing learning common parasitic diseases within the curriculum. This included suggestions to weigh the allocated teaching hours to match the prevalence of common diseases encountered during the intern and post-intern years and increase the lecture hours on snakebites. Extending parasitology education across the undergraduate period was another important theme identified. This included proposals to incorporate parasitology teaching to clinical appointments and strengthen collaboration between parasitology and clinical departments.

Discussion

This study assessed the encounters and management of parasitic diseases and snakebites in Sri Lanka as experienced by the post-intern medical graduates of the University of Peradeniya. Considering the most common parasitic disease encountered in this study – scabies - South Asia is among the top five regions with the largest DALYs in the world [7]. However, there is a significant gap in the local literature on the burden of scabies. Among the limited available studies, scabies is reported mainly among child populations in Sri Lanka. [8]. Among adults, the community prevalence of scabies was 0.17% about two decades ago [9]. There is previous evidence of scabies being detected commonly in healthcare settings of the Eastern province, where it was most encountered in our study [10].

Bites and stings by arthropod species such as Order Hymenoptera (hornets and bees), Class Arachnida (spiders) and Class Chilopoda (centipedes) cause harmful effects on Sri Lankans [11]. Previous studies have also identified that admissions due to insect bites in the North Central province are common [12]. Interestingly, the geographic distribution of insect bite encounters largely overlapped the distribution of the snake bite encounters in this study, suggesting possible integrated approaches to these public health hazards.

Asia has a moderate burden of head lice compared to other regions, with a prevalence of 18% [13]. In both Asia and Sri Lanka, pediculosis is most commonly seen among children, and its prevalence has been reported to be as high as 42% among Lankan schoolchildren [8]. However, among adult populations in the country, it had a limited prevalence of 0.22% [9]. No previous studies had examined the burden of head lice in the geographies identified by this study.

Intestinal cestodes and visceral larva migrans were among the least encountered parasites in the study. These zoonotic infections are more commonly detected within animal reservoirs than among humans. Human infections of tapeworms and visceral larva migrans have been mainly reported among paediatric populations in Sri Lanka [14,15]. The other least encountered condition - trichomoniasis - is underdiagnosed and under-treated in the Sri Lankan health system [16]. Therefore, its minimal encounters may not always reflect a low prevalence.

Nearly two-thirds of the post-intern doctors' self-reporting to be competent in managing parasitic diseases was a positive trend. Though only about 40% reported the unavailability of a parasitologist, nearly 90% had not been involved in referring. This signalled an underutilization of the available specialist services. However, only 1% suggested increasing teaching on the referral process, which implied that this issue was largely attitudinal rather than knowledge-based.

The geographical distribution of the snakebite encounters tallied previous evidence in Sri Lanka, where a national geospatial analysis had also identified North Central and Sabaragamuwa Provinces as having the highest risk for snakebites [17]. However, the Uva province had a comparatively lower incidence of snakebites in that study, which did not match our findings. Another national survey identified the highest requirement of antivenom vials among hospitals in the wet zones (of lower altitude) and dry zones of Sri Lanka, which overlapped the Sabaragamuwa, North Central and North Western provinces identified in this

study [6]. Over 90% self-reported their ability to recognize the snake when encountering snakebite cases was another positive development. However, contrary to our findings, previous studies in Sri Lanka have reported difficulties identifying the offending snake since it is not routinely brought to the hospital [6].

Global literature on attitudes toward parasitology education gives a mixed picture. However, in keeping with our findings, recent studies among medical students in Iran and veterinary students in Germany showed positive views on parasitology teaching methods and their relevance in controlling parasitic diseases [18,19].

Considering future research directions, our results emphasize the need to update evidence on the burden of commonly encountered parasitic diseases like scabies in Sri Lanka. It also identifies geographies where future epidemiological investigations can be planned, especially for under-studied challenges like pediculosis. Considering practice implications, these findings urge us to focus on insect bites and stings and their management during undergraduate training in Sri Lanka. Almost all post-intern doctors encounter snake bite cases, and over two-thirds administer antivenom. Thus, targeted training of interns on snake bite management is demanded, preferably within internship orientation programs. Direct recommendations for parasitology teaching in Sri Lanka are listed as themes emerging from the open-ended suggestions.

Our study had several limitations. First, this study used the encounters by the post-intern doctors as a proxy for the burden of parasitic diseases and snakebites in Sri Lanka. This may not become an accurate reflection due to the mild cases that do not present in healthcare settings, to cases that present in other primary care settings to which interns are not routinely allocated and owing to under and missed diagnosis of parasitic diseases. Second, this study recruited post-intern doctors from a single university in Sri Lanka, and hence, there was an uneven provincial representation, including absence from the Northern Province. These limitations may have affected the accuracy of the percentage estimates. Third, as in the case of most online surveys, the study's response rate was poor, and it may have introduced a considerable selection bias. Fourth, this study had to rely on post-intern doctors' recall of internship experience, which may have introduced a significant recall bias during data collection.

Conclusions

Almost all doctors encountered patients with snakebites. Scabies, insect bites, and stings, and head lice were commonly encountered by post-intern doctors, with notable variations in their distribution. Essential challenges and management practices were identified. Overall, participants were positive toward parasitology education and its impact on disease management.

References

1. Global health estimates: Leading causes of DALYs [Internet]. [cited 2022 Jan 10]. Available from: https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/global-health-estimates-leading-causes-of-dalys

2. Kasturiratne A, Wickremasinghe AR, de Silva N, Gunawardena NK, Pathmeswaran A, Premaratna R, et al. The global burden of snakebite: a literature analysis and modelling based on regional estimates of envenoming and deaths. PLoS Med. 2008;5(11):e218. doi:10.1371/journal.pmed.0050218

3. Bandara S. Public health system of Sri Lanka: Past, present, and future. In Ruwanpura KN & Mohamed Saleem MA. Editors. Routledge Handbook of Contemporary Sri Lanka. 1st ed. London: Routledge;2025. p. 349–60. doi:10.4324/9781003300991

4. Ministry of Health. Indoor Morbidity and Mortality Report 2021. 2021. [cited 2021 Aug 1]. Available from: http://www.health.gov.lk/moh_final/english/others.php?pid=110

5. Silva A, Marikar F, Murugananthan A, Agampodi S. Awareness and perceptions on prevention, first aid and treatment of snakebites among Sri Lankan farmers: a knowledge practice mismatch? J Occup Med Toxicol. 2014;9:20. doi:10.1186/1745-6673-9-20

6. Kasturiratne A, Pathmeswaran A, Fonseka MMD, Lalloo DG, Brooker S, De Silva HJ. Estimates of disease burden due to land snake bite in Sri Lankan hospitals. Southeast Asian J Trop Med Public Health. 2005;36(3):733-40.

7. Karimkhani C, Colombara D V, Drucker AM, Norton SA, Hay R, Engelman D, et al. The global burden of scabies: a cross-sectional analysis from the Global Burden of Disease Study 2015. Lancet Infect Dis. 2017;17(12):1247-54. doi:10.1016/S1473-3099(17)30483-8

8. Gunathilaka N, Chandrasena N, Udayanga L. Prevalence of ectoparasitic infections and other dermatological infections and their associated factors among school children in Gampaha District, Sri Lanka. Can J Infect Dis Med Microbiol. 2019;2019(1):5827124. doi:10.1155/2019/5827124.

9. Perera A, Atukorala DN, Sivayogan S, Ariyaratne VS, de A Karunaratne L. Prevalence of skin diseases in suburban Sri Lanka. Ceylon Medical Journal. 2000;45(3):123-28. doi:10.4038/cmj.v45i3.8112

10. Thadchanamoorthy V, Dayasiri K, Thamilvannan N, Anand G. 891 A study of clinical–demographic profile and quality of life in patients with scabies from a tertiary care hospital in Eastern Sri Lanka. Arch Dis Child. 2022;107:A250. doi:10.1136/archdischild-2022-rcpch.403

11. Kularatne SAM, Shahmy S, Rathnayake SS, Dawson AH. Clinico-epidemiology of arthropod stings and bites in primary hospitals of Northwestern province of Sri Lanka. Clin Toxicol. 2018;56(10):880-5. doi:10.1080/15563650.2018.1447120

12. Wijerathne BTB, Rathnayake GK, Agampodi SB. Hornet stings presenting to a primary care hospital in Anuradhapura District, Sri Lanka. Wilderness Environ Med. 2014;25(1):122-6. doi:10.1016/j.wem.2013.09.012

13. Hatam-Nahavandi K, Ahmadpour E, Pashazadeh F, Dezhkam A, Zarean M, Rafiei-Sefiddashti R, et al. Pediculosis capitis among school-age students worldwide as an emerging public health concern: a systematic review and meta-analysis of past five decades. Parasitol Res. 2020;119:3125-43. doi:10.1007/s00436-020-06847-5

14. Iddawela DR, Kumarasiri PV, de Wijesundera MS. A seroepidemiological study of toxocariasis and risk factors for infection in children in Sri Lanka. Southeast Asian J Trop Med Public Health. 2003;34(1):7-15.

15. Amarasinghe A, Le TH, Wickramasinghe S. *Bertiella studeri* infection in children, Sri Lanka. Emerg Infect Dis. 2020;26(8):1889-92. doi:10.3201/eid2608.200324

16. Banneheke HA, Fernandopulle R, Gunasekara UM, Gunawardene E, Fernando N, Wickramasinghe R. Clinical profile and sociodemographic aspects of trichomoniasis among females in the Western province of Sri Lanka. Sri Lankan Journal of Infectious Diseases. 2013;3(1):26-31. doi.org/10.4038/sljid.v3i1.4690

17.Ediriweera DS, Kasturiratne A, Pathmeswaran A, Gunawardena NK, Wijayawickrama BA, Jayamanne SF, et al. Mapping the risk of snakebite in Sri Lanka; a national survey with geospatial analysis. PLoS Negl Trop Dis. 2016;10(7):e0004813. doi:10.1371/journal.pntd.0004813

18. Khani A, Ghaffari S, Kalantari N, Sheikh Z. Methods for improvement of education of parasitology & mycology's module based on viewpoints of medical students in Babol University of Medical Sciences. Medical Education Journal. 2014;2(1):47-52.

19. Strube C, Raue K, Janecek E. Simple, but not easy–Opportunities and challenges from teachers' and students' perspectives in the 21st century of veterinary parasitology teaching. Vet Parasitol. 2018;252:74-9. doi:10.1016/j.vetpar.2018.01.034