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ORIGINAL RESEARCH

Leishmaniasis: Who Uses Personal Protection among Military Personnel in Colombia?

Aida M. González, MSc, MD, María Teresa Solís-Soto, MD, PhD, Katja Radon, MSc, PhD
Munich, Germany; Washington, DC; and Bolivia

Abstract

BACKGROUND Leishmaniasis is common in Colombia, negatively affecting the health of military personnel active in endemic areas. The disease is transmitted by sand fly bites. Therefore, during duty, use of long-sleeved uniforms and other clothes treated with permethrin and application of mosquito repellent are important personal preventive measures.

OBJECTIVE The objective of this study was to assess personal and occupational factors associated with the use of personal protection in male soldiers deployed to Leishmaniasis-endemic areas.

METHODS Three hundred soldiers participated in a cross-sectional questionnaire study (response 84.3%). The self-administered questionnaire contained questions about sociodemographics, duration of service, compliance with personal mosquito protection, and knowledge about leishmaniasis. Descriptive analyses were followed by multiple logistic regression models adjusted for potential confounders (EpiInfo Version 7.0)

FINDINGS Overall, 23% of the soldiers reported complete use of the recommended personal protection measures. About 83% of the participants had heard about leishmaniasis. In the adjusted regression model, knowledge about leishmaniasis (adjusted odds ratio = 2.9; 95% confidence interval: 1.1-7.2) and being enrolled in the army for more than 5 years (2.2; 1.1-4.1) increased the odds of using personal protection.

CONCLUSIONS Improving knowledge about leishmaniasis is one measure to increase use of personal protection, thereby diminishing the risk of infection.

KEY WORDS continuous education, knowledge, leishmaniasis, military personnel, mosquito bites, personal protective equipment, sand flies.

INTRODUCTION

Leishmaniasis, a parasitic vector disease found mainly in the tropics and subtropics, spreads through the bite of tiny (1.5-4.5 mm) sand flies that produce different forms of the disease. Cutaneous presentation of leishmaniasis is the most common form, affecting 90% of those infected. The second form, visceral leishmaniasis, also affects internal organs. In Colombia, more than 55% of the annual reported leishmaniasis cases (~13,000) occur among military personnel.[1,2] The reason for this is that because of the internal conflict in the country, military troops deployed to tropical climates are continuously exposed to the mosquito vector.

The use of personal protection is still considered the first line of prevention for leishmaniasis in all people working in these endemic areas because sand

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From the Center for International Health @ Institute for Occupational, Social and Environmental Medicine, University Hospital Munich (LMU), Munich, Germany (AMG, MTSS, KR); PAHO/World Health Organization, Washington, DC (AMG); and Universidad San Francisco Xavier de Chuquisaca, Sucre, Bolivia (MTSS). Address correspondence to A.M.G. (aidamarisolgonzalez@gmail.com).

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fly eradication is difficult, chemoprophylaxis drugs are not effective, and vaccines are still under development.[3] Furthermore, because of their jobs, soldiers cannot stay indoors from dusk to dawn, when sand flies bite the most.[4] Antivectorial protection includes proper wearing of a uniform impregnated with permethrin, long sleeves rolled down, and pants tucked into the boots; use of cap; and application of insect repellents. The effectiveness of these measures depends on their appropriate use.[5]

Compliance with personal protective measures is generally low. In other occupational groups, like farmers and health workers, factors such as age, perception, skills, knowledge, and time spent at work have been identified to be predictors of their use.[6-9] Whether these factors also apply to military personnel is still not known.

Therefore the aim of this study was to estimate compliance with protective measures against sand fly bites among military personnel deployed to a tropical area of Colombia. In addition, we aimed to identify associated risk factors to help develop targeted prevention strategies for this occupational group.

MATERIALS AND METHODS

Study Population. This cross-sectional study was carried out among male military personnel 18 years and older of a mobile brigade deployed to San Vicente del Caguán, Caquetá-Colombia. The brigade is formed by 4 terrestrial combat battalions working in the tropical area of the region. Each of these battalions is composed of 178 individuals; thus the target population comprised 712 soldiers. Every 4 months they participate in a resting and training cycle that takes place in Tolemaida at the Centro Nacional de Entrenamiento de Ejército (National Military Training Center). The 2 battalions trained at the center between October and December 2014 were invited to participate in the anonymous questionnaire survey. For this, the commander in chief from Mobile Brigade 9 invited all commanders of the 4 battalions through a daily radio program. The commanders from each battalion then verbally invited all military personnel who worked in the Caguán area to participate in an Occupational Safety and Health activity by answering the survey. The military personnel were informed that the activity would take place during the resting and training cycle in Tolemaida.

During the resting and training cycle each of the soldiers received an appointment to answer the questionnaire. Wherever possible, military personnel completed the questionnaire themselves. If level of literacy was too low, 2 trained interviewers and 1 of the authors (AMG) were present to read the questions aloud. Of the 356 eligible individuals, 50 did not participate because they were either absent for medical reasons (n = 12) or they did not want to participate (n = 38) (response rate 84.3%).

Ethical approval was obtained by the Ethics Committee of the University Hospital Munich and Ethics Committee of the Clinica de la Universidad de la Sabana and authorization from Dirección de Sanidad de Ejército Nacional (Colombia).

Study Instruments. Participants completed a self-administered questionnaire divided into the following parts[10,11]:

1. Sociodemographic information, including age, gender, years of service in the army, and educational level;
2. Use of personal protection to prevent leishmaniasis;
3. Past leishmaniasis infections;
4. Knowledge and attitudes about leishmaniasis.

Definition of Variables. Adequate use of personal protection against mosquito bites was defined as a soldier who reported using (1) the complete uniform impregnated with permethrin, (2) long sleeves rolled down, (3) cap, (4) boots, and (5) mosquito repellent in all exposed areas of the body.

Age was assessed in 3 categories (18-20, 20-29, and ≥30 years). Duration of service was dichotomized at the median (5 years). Education was divided into 3 groups: incomplete elementary studies, complete elementary studies, and more than elementary studies. Knowledge about leishmaniasis was defined as ever having heard about a disease called leishmaniasis. To assess leishmaniasis attitude, on the questionnaire participants were asked to identify whether soldiers are a high-risk group for acquiring leishmaniasis in an endemic area.

Statistical Analyses. Data were entered using EpiInfo Version 7.0 with double entry and consistency check. Six participants had to be excluded because they did not answer the questions about leishmaniasis, leaving 300 soldiers for the analyses.

First, soldiers having heard about leishmaniasis were compared with those who had not using a χ^2 test. Second, prevalence of personal protection was determined by potential predictive factors. Finally, unadjusted and adjusted logistic regression models were developed including variables with P value < .1 in the bivariate analysis.

Table 1. Absolute and Relative Frequency of Sociodemographics and Risk Perception by Knowledge About Leishmaniasis Among 300 Military Personnel Deployed to a Tropical Area of Colombia

		Knowledge About Leishmaniasis*				
		No N = 52		Yes N = 247		*P*
Variable	Categories	n	%	n	%	χ^2
Age groups	<20 y	8	15.4	17	6.9	.02
	20-29 y	36	69.2	155	62.8	
	≥30 y	8	15.4	75	30.4	
Education	<Elementary	11	21.2	36	14.6	.38
	Elementary	17	32.7	101	40.9	
	>Elementary	24	46.2	110	44.5	
Years in the army	>5 (median)	14	26.9	136	55.1	<.01

* Evaluated by 1 item asking whether the soldier had heard about a disease called leishmaniasis.

RESULTS

The majority of the participants were between 20 and 29 years old (63%); 55% of the population reported elementary education or less. Most of the soldiers had heard about leishmaniasis before (83%). The 12-month prevalence of leishmaniasis was 3%. About half of the participants considered themselves a high-risk group for acquiring the disease. A total of 23% of the soldiers reported complete use of protective measures against the vector.

Military personnel without knowledge about leishmaniasis were statistically significantly more likely to be younger and had been working for a shorter time in the army (Table 1).

Predictors of complete use of protective measures against sand flies were knowledge about leishmaniasis (26% vs 12% for those without knowledge), younger age (28% among those younger than 20 years. vs 17% among those older than 30 years) and longer duration of service in the army (>median: 27% vs ≤ median: 20%). Associations became stronger after mutual adjustment (Table 2).

DISCUSSION

This study among terrestrial military personnel deployed to a tropical area of Colombia found a low compliance with protective measures to prevent occupational exposure to Leishmaniasis. Factors

Table 2. Prevalence of Use of Protective Measures* by Potential Predictors and Results of the Unadjusted and Mutually Adjusted Logistic Regression Analysis for 300 Military Personnel Deployed to a Tropical Area of Colombia

		Prevalence N = 70		Unadjusted Logistic Regression N = 300		Adjusted Logistic Regression N = 300	
		n	%	OR	95% CI	OR	95% CI
Knowledge about leishmaniasis†	No	6	11.5	1		1	
	Yes	70	23.3	2.68	1.09-6.58	2.86	1.13-7.24
Age groups	<20 y	7	28.0	1		1	
	20-29 y	49	25.7	0.89	0.35-2.52	0.54	0.20-1.47
	>30 y	14	16.9	0.52	0.18-1.48	0.20	0.06-0.66
Education	<Elementary	13	27.7	1		1	
	Elementary	21	17.8	0.56	0.26-1.25	0.49	0.21-1.11
	>Elementary	36	26.9	0.96	0.46-2.02	0.80	0.37-1.75
Years working within the army	≤ 5 (median)	30	20.1	1		1	
(median)	>5 (median)	40	26.7	1.44	0.84-2.47	2.15	1.12-4.14

CI, confidence interval; OR, odds ratio.
* Permethrin-treated uniform properly worn; application of insect repellent to the skin.
† Evaluated by 1 item asking whether the soldier had heard about a disease called leishmaniasis.

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contributing to increased odds for the use of protective measures were knowledge about leishmaniasis and having worked within the army for more than 5 years. At the same time, younger soldiers were more likely to report use of protective measures.

The statistically significant relationship between longer duration of working within the army and use of protective equipment could be due to previous experience with leishmaniasis. Other studies indicated increased use of personal protection with personal experience of susceptibility.[6] At the same time, it is interesting that especially the youngest soldiers report higher compliance with the safety measures. The literature is inconsistent regarding the effect of age on the use of personal protection: Although older workers were found to use more sun protection,[6] younger health care workers were more likely to use personal protective equipment against pertussis.[7] As in our study, others have found that knowledge about the risk motivates prevention.[12-15] Therefore, further training, including knowledge about leishmaniasis but also about the different preventive measures, seems to be indicated among soldiers deployed to leishmaniasis-endemic areas.

Our study reached a high participation rate, making selection bias unlikely. In addition, it can be assumed that the soldiers participating in the study were representative of Colombian soldiers deployed to tropical areas. The number of soldiers included was high, permitting high statistical power. The number of uncomplete questionnaires was very low (6 out of 306) so that item nonresponse was not a problem. Questionnaires were taken from a previously validated instrument and, where necessary, were translated and back-translated.[10,11]

Nevertheless, we cannot completely rule out misclassification of the outcome among soldiers who were aware of the correct measures for personal protection. However, the anonymous nature of the study and the fact that the investigator was not a member of the army should have reduced the likelihood of this error. With respect to use of personal protection, we cannot know how regularly the measures were used correctly. Therefore the prevalence of regular correct use of protective measures is likely to be lower than 23%. We did not consider the use of mosquito nets as a safety measure because this is considered a nonoccupational risk in Colombia.

One has to take into account that the level of knowledge about leishmaniasis was not evaluated in detail. Instead, the general question "Have you ever heard about a disease called Leishmaniasis?" was used. Therefore it is possible that although more than 80% of the population reported some knowledge about leishmaniasis, they did not know the associated risks and preventive measures. Therefore the level of knowledge might have been overestimated in our study.

Finally, because of the military setting it was not possible to assess the perceived norm for use of protective measures, which in other studies was found to be an important predictor.[16,17] In addition, barriers to correct use of protective measures were not assessed. In this context, heat in the tropical area might play an important role.[16]

CONCLUSIONS

Complete use of protective measures against sand flies is low among military personnel deployed in tropical areas of Colombia. Lack of knowledge seems to play an important role. Based on our studies, teaching interventions should be implemented.

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