What do Portuguese Travellers Know About Malaria? Pre-Travel Medicine Appointment Evaluation

O que Sabem os Viajantes Portugueses Sobre Malária? Avaliação Pré-Consulta de Medicina de Viagem

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ABSTRACT

Introduction: The knowledge of transmission, prevention and symptoms of malaria is essential for travellers' safety. In real life, what do Portuguese travellers know about malaria before a Travel Medicine consultation? How can we, through this consultation, improve their knowledge?

Material and Methods: Before an appointment with a specialist in Travel Medicine, 80 adult travellers filled a questionnaire that included demographic aspects, characteristics of the trip and knowledge about malaria. Data were analysed using descriptive statistics and multifactorial variance analysis.

Results: The travellers' ages fell in the range 20 - 80 years, 51% were male and 74% of the travellers had a university degree level of education. For 74% of the travellers, this was the first Travel Medicine consultation. Half of the travellers planed trips lasting no more than 14 days, mainly for tourism. The average percentage of correct answers about malaria given by a traveller was 63%. Travellers who had previously attended a Travel Medicine appointment exhibit a statistically significant difference in knowledge comparing to those who attend Travel Medicine appointment for the first time, and this was more evident in the sample composed of travellers without higher education. The clinical manifestations and prevention had the lowest number of correct answers among the travellers.

Discussion: These travellers appear to have good knowledge about malaria but some misconceptions prevail.

Conclusion: The Travel Medicine consultation seems important to raise awareness in the population about malaria, particularly for travellers without higher education. The prevention and the recognition of malaria symptoms must be prioritized during Travel Medicine consultations and the information given adapted to the traveller's characteristics.

Keywords: Malaria; Portugal; Travel Medicine

RESUMO

Introdução: O conhecimento das formas de transmissão, prevenção e clínica de malária é fundamental para a proteção dos viajantes nas deslocações para zonas endémicas. O que sabem os viajantes portugueses sobre malária previamente à consulta de Medicina de Viagem? Como poderemos através dessas consultas colmatar falhas nesse conhecimento?

Material e Métodos: A 80 viajantes adultos, foi solicitado, antes da entrada na consulta, o preenchimento de um questionário dividido em dados demográficos, características da viagem e questões sobre malária. Na análise estatística dos resultados usámos métodos de Estatística Descritiva e de Análise de Variância Multifatorial.

Resultados: Os viajantes tinham idades entre 20 - 80 anos, 51% eram do sexo masculino e 74% tinham escolaridade superior. Para 74% dos viajantes esta foi a primeira Consulta de Medicina de Viagem. Em metade dos viajantes a duração da viagem era inferior a 14 dias e maioritariamente viajaram por lazer. Em média cada viajante respondeu corretamente a 63% das questões. Viajantes com consultas prévias evidenciam uma diferença estatísticamente significativa nesse conhecimento relativamente aos que recorrem pela primeira vez, que, na nossa amostra, se observou sobretudo nos viajantes que não têm escolaridade superior. O reconhecimento de manifestações clínicas e formas de prevenção revelam menos respostas corretas.

Discussão: Nestes viajantes os conhecimentos sobre malária revelaram-se razoáveis mas persistem conceções erradas.

Conclusão: A consulta de Medicina de Viagem é importante para o conhecimento sobre malária, sobretudo nos viajantes sem escolaridade superior. Prevenção e sintomas de malária devem ser especialmente focados e a informação deve-se adequar às características do viajante.

Palavras-chave: Malária; Medicina de Viagem; Portugal

INTRODUCTION

There are an estimated one billion people travelling the world each year and Europeans are those travelling more frequently to tropical and subtropical countries.[1,2] Globalisation, increasing urbanisation, climate change with an increasing global average temperature and ease of travel, mainly by air, have changed the paradigm of infectious diseases and had a major impact on its redistribution,[3] mainly vector-borne diseases and among these malaria.

Malaria is a parasitic disease with the highest impact on world population and is the leading cause of fever in returning travellers from Sub-Saharan Africa.[4] An approximately 20% mortality rate has been associated with malaria, mainly regarding severe forms of malaria and particularly affecting non-immune travellers.[5]

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All the investment made on preventive measures taken to reduce malaria is therefore crucial, meaning that travellers going and returning from malaria-endemic regions must have basic knowledge about the disease and its mode of transmission.

What do Portuguese travellers know about malaria? Different international studies have been published on knowledge and attitude about malaria.[6-16]

Some of these studies were aimed at specific groups of travellers, such as those returning to their country of origin visiting friends / relatives,[6,12] tourists[13] or business travellers.[7,16] Studies on knowledge about malaria in experienced travellers have been carried out[6] as well as involving travellers going to malaria-endemic countries.[11] Other studies were aimed at pre-travel health advice [Travel Medicine consultation (TMC)], at the quality of the information provided[11,14,17-20] and at the influence of these consultations on traveller's knowledge about malaria.[6,12,13]

As far as we know, a Master's thesis aimed at assessing traveller's awareness and compliance to malaria chemoprophylaxis[21] as well as a study carried out at the Tropical Medicine Clinic of the *Instituto de Higiene e Medicina Tropical* by R Teodósio *et al.*[14] in which a questionnaire for malaria awareness survey has been addressed to travellers over 15 years of age going to malaria-endemic regions have ever been published in Portugal. Responses from two groups were compared (one control group involving 207 respondents before attending a TMC and an experimental group of 202 respondents after having attended this consultation). Higher correct response rate has been found in the experimental group, reaching almost 100% in some items (transmission by a mosquito bite, use of insect repellent as way of prevention, prophylactic regimen before, during and after travelling) and an increased basic knowledge of malaria has been found after attending a TMC even though not reaching a 100% rate and some myths and preconceptions persisted.

Due to the lack of information, this study was aimed at evaluating traveller's awareness of malaria based on a sample of travellers attending a Travel Medicine clinic. The way certain factors have had an influence on malaria knowledge, including demographic and sociocultural factors, previous TMC, previous travel outside Europe (focused on travelling to endemic regions) and travel-related aspects were also evaluated. The study was also aimed at providing adequate information about malaria and its prevention to travellers attending a TMC.

MATERIAL AND METHODS

Participants

All adult travellers were required to anonymously fill in a written questionnaire before attending a TMC at the *Centro Hospitalar de São João* during May and July 2017. Participant's consent was orally obtained following an oral and written description of the study objective and none of the participants has received any kind of financial compensation.

The study was approved by the Ethics for Health

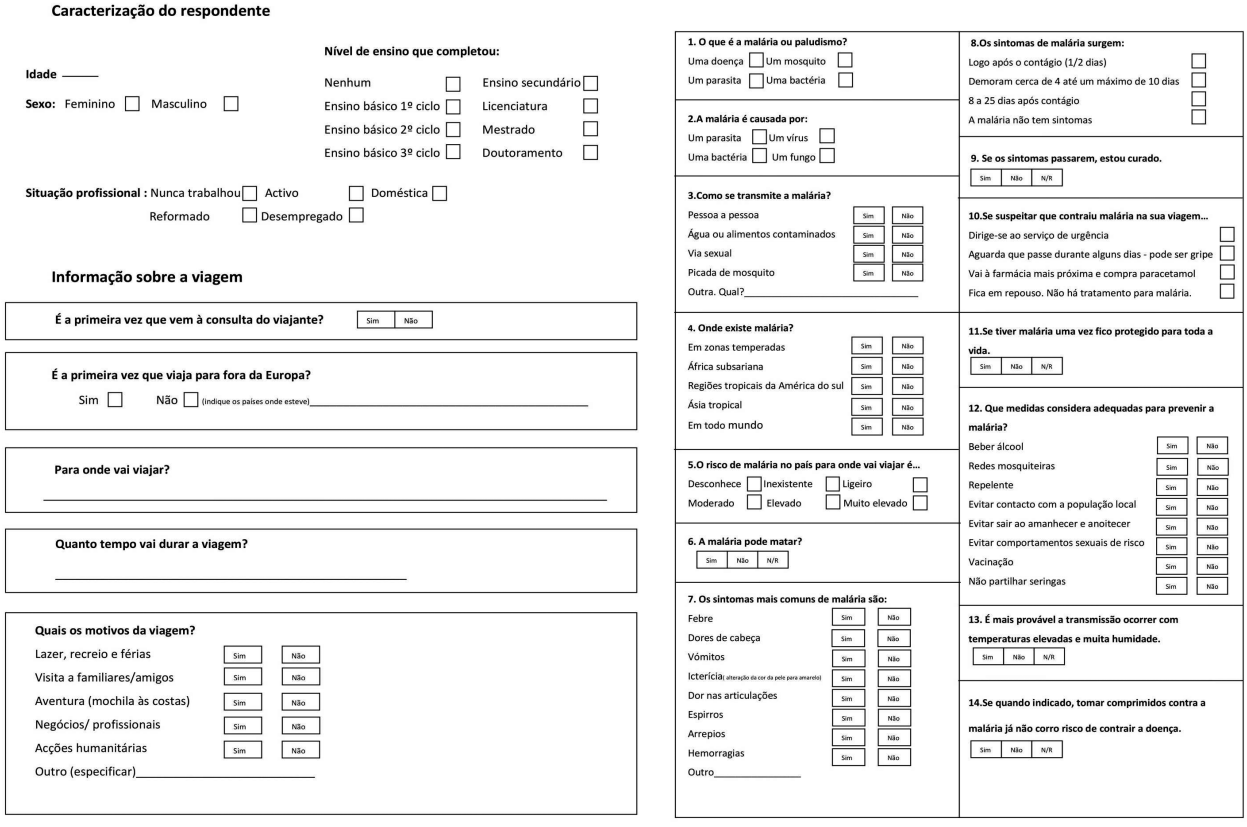

Figure 1 – Model of questionnaire delivered to travellers before attending a Travel Medicine consultation

Committee of the *Centro Hospitalar de São João / Faculdade de Medicina da Universidade do Porto*.

Instruments

An anonymous and confidential three-section questionnaire has been used (first section aimed at the characterisation of travellers, second section regarding the trip and third section aimed at assessing malaria knowledge) (Fig. 1).

Statistical analysis

Data were analysed by use of Microsoft Office Excel 2007 and SPSS (Statistical Package for the Social Sciences) version 24.0 software.

Methods of descriptive statistics were used for the characterisation of respondents, trip information and characteristics of responses given by travellers to items/statements about malaria. Countries were grouped according to the different endemic regions and one additional category for non-endemic countries was used in order to make data analysis easier, both for previous and current trip.

Questions were grouped into four main categories, according to the domain in which these are included: epidemiology (items 3;4;5;13), clinical presentation (items 1;2;6;7;8;9), prevention (item 12) and treatment (items 10;11;14). The number of correct responses has been obtained followed by the total of correct responses to the questionnaire within the four domains. Non-responses and 'do not respond' were considered as incorrect responses. Multifactorial analysis of variance has been carried out, considering the following as response variables (dependent variables): epidemiology, clinical presentation, prevention, treatment and final score (summarising all the previous variables and subsequently analysed); traveller gender, education, occupation, initial TMC, previous trip outside Europe, destination and nature of trip were considered as study factors while patient's age and length of trip as co-variables. Pillai's trace and Roy's largest root were used to assess the significance of factors' effect on traveller responses.[22] A level of statistical significance of $\alpha = 0.05$ was established. Non-parametric versions were used in inferential analysis, as there were doubts on the effects of non-validity of multi-normality requirements of dependent variables and co-variance homogeneity of each group (with quite different dimensions).

Table 1 – Respondent characteristics

Factor		Total travellers
Gender	Female	39
	Male	41
Education	Secondary Education	21
	High Education	59
Occupation	Unemployed	24
	Active	56
First consultation	Yes	59
	No	21
First time outside Europe	Yes	29
	No	51
Destination	Southwest Asia	35
	South America	25
	Sub-Saharan Africa	39
	Non-endemic	4
Purpose of trip	Tourism	49
	Business	21

RESULTS

Two from the 82 delivered questionnaires were excluded from the study due to missing responses regarding one of the three sections.

Section 1: Characterisation of respondents

A general characterisation of respondents and their trips is shown in Table 1.

Respondent's age (35.1 mean age) ranged between 20 and 80 years, with a 14.1 year standard deviation; 75% were aged 41 or under and the 28-32 age group was most frequently found; 41 male respondents were found (51%) and age distribution is shown in Fig. 2. Predominantly Caucasian respondents participated in the study.

As regards respondent's education, 74% (n = 59) had higher education and 26% (n = 21) had basic and secondary education (Fig. 2) while 56 respondents (70%) had a professional occupation (Fig. 2).

Section 2: Trip information

A total of 59 travellers (74% of the total) had never attended a TCM (Fig. 3) and 31% from these had already travelled to at least one malaria-endemic destination.

A percentage of 64% (n = 51) respondents had already travelled outside Europe. The geographical distribution of previous trips is shown in Fig. 4.

When previous trips were grouped per geographical area (125 in total), Sub-Saharan Africa and tropical regions in South America were the most frequent destinations to endemic regions.

When current trip destination justifying current attendance to TMC were considered, a sample of 103 destinations divided by 26 countries was obtained and Mozambique and Indonesia were the most frequent destinations, corresponding to 15% (n = 15) each. When destinations were considered by region, malaria-endemic regions were mostly included 96% (n = 99), mainly from Sub-Saharan Africa [38% (n = 39)] and Tropical Asia [34% (n = 35)].

Eight responses were not considered for the analysis of length of trip due to the fact that invalid or no responses were given. Most respondents were travelling for not over 14-day length and 31% for over a four-week length of stay (Fig. 3).

'Tourism' was the main reason for travel [49 respondents (46%), while 21 respondents (20%) were travelling for 'business' (Fig. 3)].

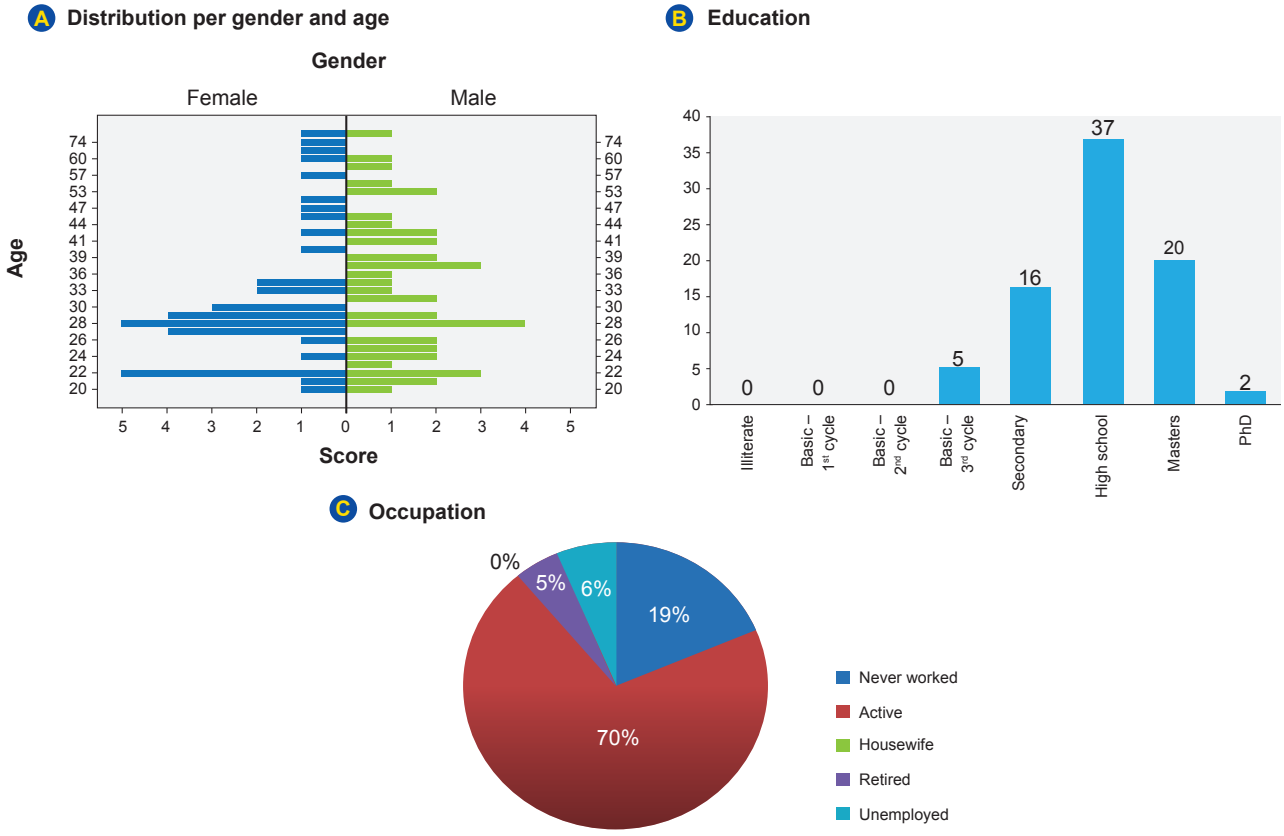

Figure 2 – Distribution chart of travellers according to gender and age (A), education (B) and occupation (C)

A four-week average length of trip was described by the 12 respondents 'visiting friends/relatives' while a 2.8 week length was described by the 65 respondents who travelled for 'tourism', 5.1 weeks by 21 respondents who travelled for 'business' and 7.2 weeks by the nine respondents who travelled for 'humanitarian aid actions'.

Section 3: Questionnaire about malaria

A 21.5 / 34 average correct response rate has been found, i.e. 63% of the questions were correctly responded (Table 2).

Highest correct answer rates were obtained with the statement *'É sintoma de malária… Febre'* (It is a symptom of malaria … Fever), 97.5% (n = 78) and *'A malária é transmitida por…picada de mosquito'* (Malaria is transmitted by … a mosquito bite), 96.3% (n = 77). Lowest rates were found with the statement *'Vacinação como forma de prevenção de malária'* (Vaccination as a way of malaria prevention), 20% (n = 16). Only one respondent has correctly answered to all the items (Table 3).

As regards the risk of malaria at destination, 19% of respondents were able to correctly describe it, while the remaining respondents have wrongly described it or were unaware (Fig. 3). By use of a multifactorial variance analysis, statistically significant differences were found when the total number of correct responses to the questionnaire was compared for different levels of education (TP = 0.336, $\chi^2(4) = 23.51$, $p = 0.000$). When clinical presentation was specifically considered, a significant effect of the level of education on response quality has been found (TP = 0.085, $\chi^2(1) = 5.915$, $p = 0.015$) (Fig. 5). Significant differences in the number of correct responses to the questionnaire about malaria were also found between respondents who were attending for the first time *vs.* those having previously attended to a TMC (TP = 0.192 $\chi^2(4) = 13.41$, $p = 0.009$). The effect of interactions between 'education' and 'gender' on the variable 'number of correct answers regarding clinical presentation', which is shown in Fig. 5, is worth studying.

No evidence has been found regarding a significant effect of malaria knowledge on travellers having previously travelled outside the European continent (TP = 0.046, $\chi^2(4) = 3.21$, $p = 0.532$), leading to $30 \leq p \leq 0.92$ in the different dependent variables.

No other significant effects were found on the four major categories or between these effects.

DISCUSSION

Section 1: Respondent characterisation

Data regarding respondent characterisation were compared to the last Tourism statistics published by the *Instituto Nacional de Estatística (INE)* (Statistics Portugal) aimed at checking the representativeness of the sample.

According to the INE, 29.3% of the 2016 Portuguese travellers were aged 25-44 (52.6% were female).[23] Predominantly young travellers and gender ratios close to 50% were found in our group of respondents, showing similar

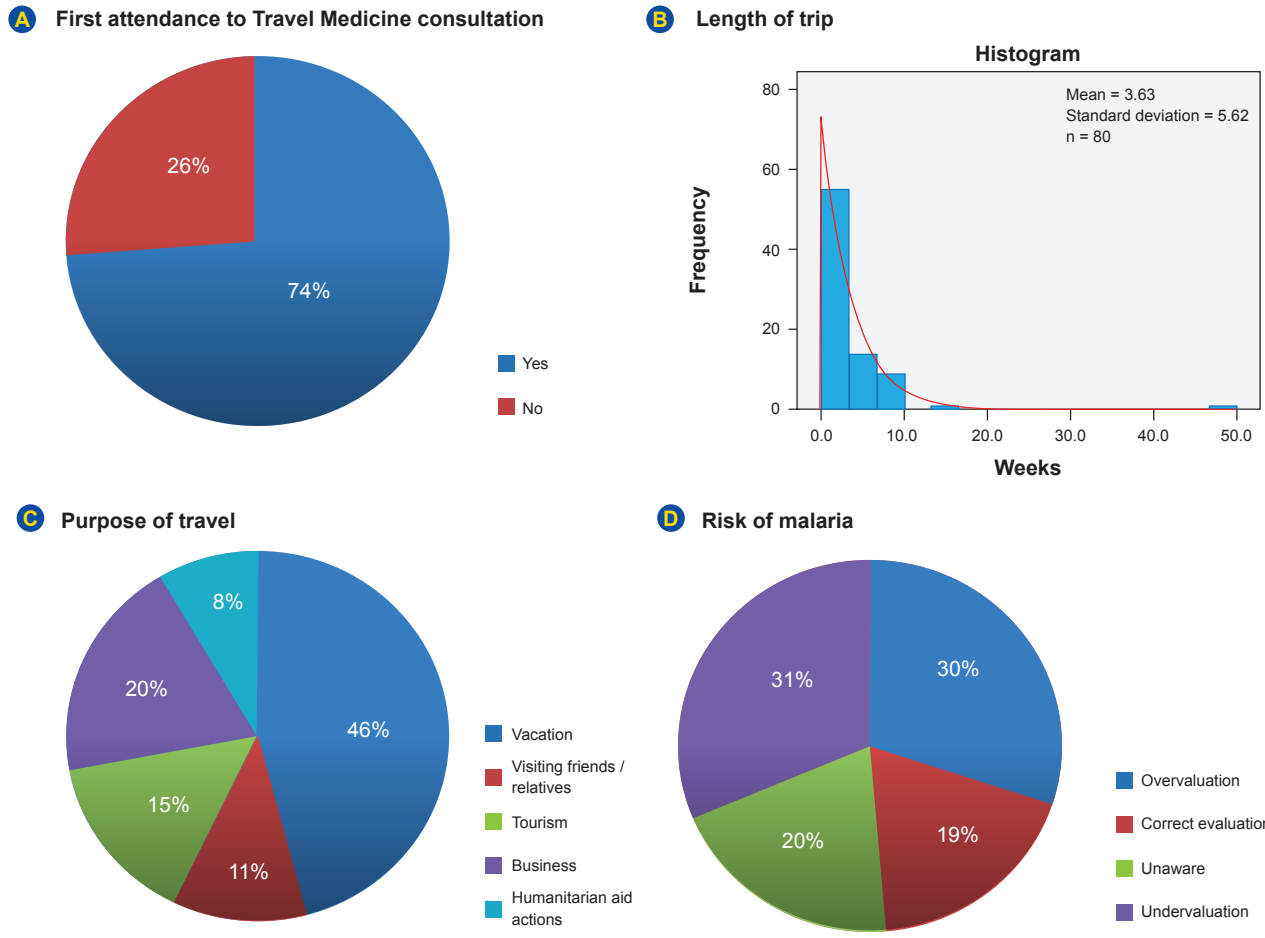

Figure 3 – Distribution according to (A) first attendance to Travel Medicine consultation, (B) length of trip, (C) purpose of travel and (D) ranking of the risk of malaria at destination

gender and age characteristics to those wound in the 2016 Portuguese travellers.

Section 2: Travel information

In line with the trend already found in previous studies towards a low uptake of pre-travel health advice,[7,8,15,20,24-26] most travellers in our sample had never attended a TMC, even though 31% of those having never attended a TMC had travelled at least once to an endemic region.

Short trip, travelling alone and coming from a malaria-endemic country seem to be predictors for low uptake of pre-travel health advice.[24,27] This was not found in our study, despite a short average length of trip. This may be explained by the fact that mostly high education and young respondents were found in our group and therefore more aware of the need for pre-travel health advice.

According to other authors, lack of concern with travel-related diseases,[8,9,18,20] short time for travel planning[8,10,15] and unawareness of the need to attend a TMC[8] were the main reasons for not seeking pre-travel health advice; this was a worrying conclusion, even though it was not among the study aims.

Previous studies have shown varying uptakes of pre-travel health advice according to the different traveller groups and travel purpose. Only 11% of our respondents were travelling 'to visit friends and relatives'; the lowest uptake of pre-travel health advice has been found in these respondents [6,12,18,20,24] and, due to the fact that similar living conditions to those living at the destination have been described by these respondents, these were the group with the highest risk of travel-related illness.

According to the 2016 INE information, 'visiting friends/relatives' corresponded to 4.7% of trips abroad and was the second most frequent purpose.[23] The low uptake of pre-travel health advice found in this group is probably due to the fact that these are travellers returning to their country of origin and therefore considering themselves as immune and in no need for any advice, specifically regarding malaria prevention, awareness or chemoprophylaxis.

'Tourism' was described in our study by 46% of travellers, in line with the INE data describing this purpose as the most frequent purpose of travel in 2016 Portuguese travellers.[23]

Also according to the INE data, a 7.6 day mean length of trip has been described by Portuguese travellers, longer by those 'visiting friends/relatives' (11.5 days) and shorter by those travelling for 'tourism' (6.3 days).[23]

Higher mean lengths of trip have been found in our study, even though the shortest mean length of trip corresponded to those travelling for 'tourism'. Travellers

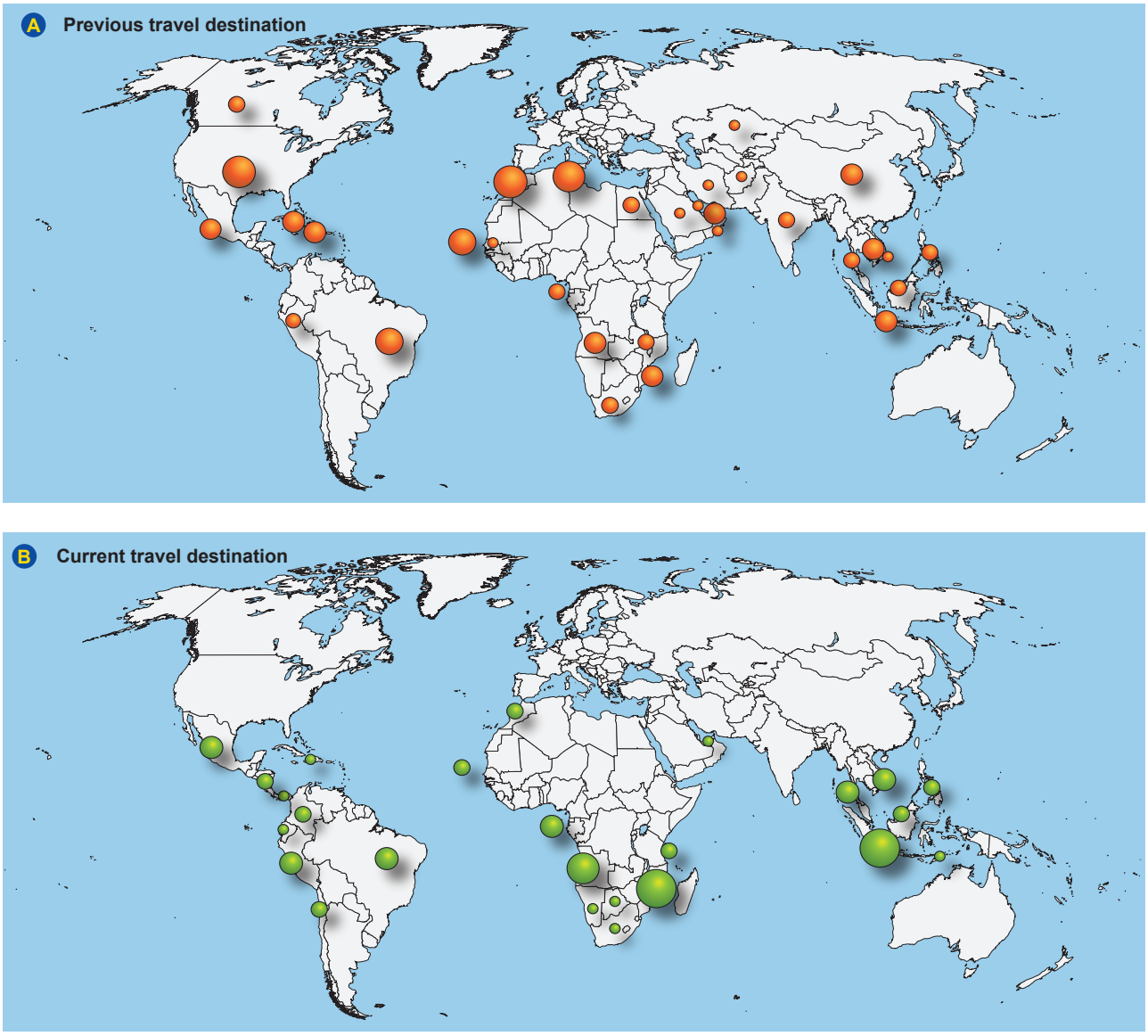

Figure 4 – Geographical distribution of destinations of previous (A) and current travel destination (B)

'attending humanitarian aid actions' (corresponding to the longest mean length of stay) were not included in the INE data and therefore could not be compared.

Most trip destinations were to malaria-endemic regions, mainly in Sub-Saharan Africa and Tropical Asia, in line with previous studies carried out in other countries, namely in Spain, with Sub-Saharan Africa as the leading destination,[28] in Switzerland and Sweden, with Thailand as the most popular destination[26] and in France, with Senegal as the leading destination.[29] Destinations may still be influenced by the time of the year in which surveys were made (May to July), corresponding to the start of the main leisure travel season.

Section 3: Questionnaire about malaria

Awareness of malaria has been shown, in general, by the 80 respondents in our group and, on average, a 63% correct answer rate has been found, while most respondents are aware that malaria is potentially lethal, even though the etiological agent has been described as a parasite by only slightly more than half of them.

Even though a mosquito bite has been described as the major mode of transmission by almost all respondents, some (31.2%) have considered water and contaminated food as a possible mode of transmission, in line with the conclusions obtained by other authors, with varying rates (5% – 43%).[12-14,16]

Major malaria-endemic regions were mostly identified by our respondents, although the risk of malaria in temperate climate regions has been described by around two thirds and a worldwide distribution of the disease by 57.2% of respondents. Higher access to information sources and higher disclosure of imported cases of malaria by the media may have generated some uncertainty in the population, who is unclear regarding the concepts of local and imported disease.

Awareness of the risk was correctly described by only a small percentage of respondents and full unawareness of the risk of exposure was also described by a small

percentage of respondents, in line with an European study.[8] It is worth mentioning that risk misjudgement was not only applied to risk undervaluation but also to overvaluation, in an almost similar way. These data were considered as quite worrying as they show that, despite a reasonable knowledge about malaria, this will be probably useless in a scenario in which people are unaware of their real risk of disease, which may lead to inappropriate behaviours, regarding an excessive as well as failed personal protection involving, in this case, a higher risk of exposure to the disease.

Symptoms of the disease including fever, headache, shivering and vomiting were mostly identified by respondents. Other symptoms and signs were less frequently recognised or mistakenly considered.

More than 90% of respondents have shown as knowing how to attend the Emergency department in case of suspicion of the disease, even though only a small percentage were able to identify malaria incubation period. Previous

Table 2 – Alternative answers to each item of the questionnaire about malaria (section 3), correct responses and distribution of the correct response number, obtained through the application of the questionnaire to travellers before pre-travel healthcare advice (travel medicine consultation) (n = 80)

Item	Statement	Correct response	Absolute frequency	Relative frequency (%)
Item 1		Disease	68	85
Item 2		Parasite	46	57.5
Item 3	Interpersonal	No	77	96.3
	Water and food	No	55	68.8
	Sexual life	No	72	90.0
	Mosquito bite	Yes	77	96.3
Item 4	Temperate climate areas	No	28	35.0
	Sub-Saharan Africa	Yes	59	73.8
	Tropical regions in South America	Yes	53	66.3
	Tropical Asia	Yes	55	68.8
	Worldwide	No	35	43.8
Item 5	Risk of malaria at destination		19	23.8
Item 6	Malaria is a potentially deadly disease	Yes	62	90.0
Item 7	Fever	Yes	78	97.5
	Headache	Yes	62	77.5
	Vomiting	Yes	56	70.0
	Jaundice	Yes	27	33.8
	Joint pain	Yes	33	41.3
	Sneezing	No	31	38.8
	Shivering/chills	Yes	51	63.8
	Bleeding	No	28	35.0
Item 8		8 to 25 days following the infective bite	28	35.0
Item 9		No	62	77.5
Item 10		Attend to Emergency	75	93.8
Item 11		No	60	75.0
Item 12	Drinking alcohol	No	49	61.3
	Mosquito net	Yes	67	83.8
	Insect repellent	Yes	72	90.0
	Avoiding contact with local population	No	50	62.5
	Avoiding spending time outdoors between dusk and dawn	Yes	35	43.8
	Avoiding sexual risk behaviour	No	36	45.0
	Vaccination	No	16	20.0
	Not sharing syringes	Yes	33	41.3
Item 13		Yes	71	88.8
Item 14		No	61	76.3

Table 3 – Summary about response quality

	Mean correct response rate	Travellers with no correct response	Travellers with 100% correct responses
Epidemiology	6.7/11	2 (2.5%)	11 (13.8%)
Prevention	4.5/8	4 (5.0%)	3 (3.8%)
Clinical presentation	8.0/13	0 (0.0%)	7 (8.8%)
Treatment	2.3/3	2 (2.5%)	44 (55.0%)
Final score	21.6	0 (0.0%)	1 (1.3%)

studies have reached the conclusion that awareness of the fact that symptoms may arise months after returning home is crucial, in addition to the need for seeking medical advice as soon as possible in case of any suspicion of disease in order to start treatment.[16] An increased level of knowledge regarding symptoms and incubation period is therefore crucial in order to allow for a timely diagnosis.

Anti-parasitic immunity and protection against future infection and reinfection is not granted by prior malaria episodes and relapse or recrudescence of infection with *Plasmodium vivax* or *Plasmodium ovale* may develop in case of inadequately treated infection.[30,31] More than 70% of respondents in our study seemed to know this information and recognised that symptom improvement does not necessarily means the cure and that the fact of already having had the disease does not grant any protection against future infections. The same occurs regarding prophylaxis; our respondents seemed aware that it does correspond to immunity and must be repeated every time there is a potential exposure to human plasmodia.

The lowest knowledge was found regarding malaria prevention, with a small percentage of respondents not knowing or considering that alcohol consumption and contact eviction with local population are ways of malaria prevention. Malaria transmission is directly affected by temperature and humidity and this was recognised by most of the respondents, even though the period between dusk and dawn and therefore requiring maximum protection, according to the night habit of *Anopheles spp* mosquitoes, was considered as critical by less than half of the respondents.

In line with what has been described in the previous Portuguese study carried out in 2006,[14] *'considerar que existe vacina para evitar a malária'* ('considering that there is a malaria vaccine') or *'não saber se a vacina existe ou não'* ('not knowing whether or not a vaccine exists') were described by 80% of respondents.

According to a study carried out by the EuroTravNet, patients attending pre-travel health advice are less frequently diagnosed with malaria and show a higher knowledge about the disease.[32] Data collected by the present survey suggest that previous health advice has significantly improved the average level of knowledge of respondents, with a higher impact on people with secondary education (Fig.5).

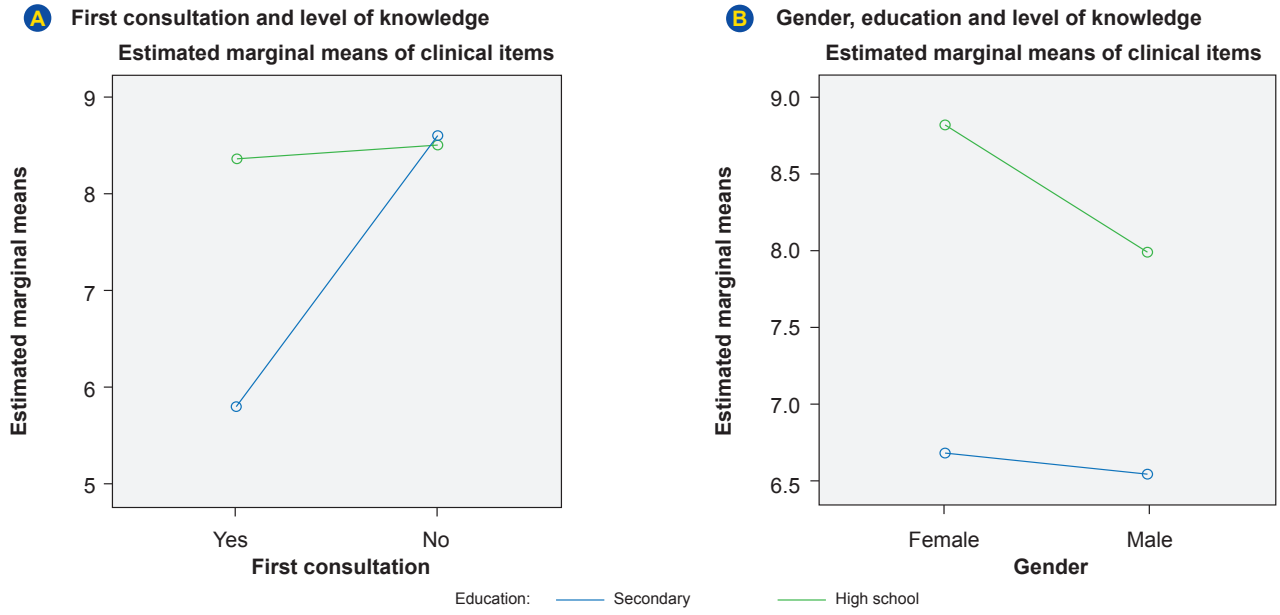

Figure 5 – Relationship between (A) first consultation and level of knowledge according to education and (B) between gender, education and level of knowledge

Co-variables in the model are evaluated according to the following values: age = 34.95, time = 3.62

Female respondents with higher education were associated with higher response quality, namely regarding clinical items (Fig.5).

It is worth mentioning that previous travels outside the European continent (mostly to malaria-endemic regions) did not seem as having a significant effect (Fig. 4) on respondent's knowledge about malaria, in support of the relevance of attending pre-travel health advice.

It seems reasonable to assume that part of the information about malaria has been acquired from the internet. However, only 11% of travellers in a previous American study logged on to CDC Traveler's Health reference site[27] and therefore incorrect underlying information could exist. In addition, the information provided by travel agents or other travellers may not be trustworthy and wrong concepts could have been perpetuated or under or overvaluation of the risk awareness could have existed.[7,8,13,20,26]

Preponderance of 'tourism' trips and a small sample that is not representative of the Portuguese common traveller, namely regarding education, which is quite high in this group of respondents, were the main limitations of the study that should be considered for further studies.

CONCLUSION

Our group of travellers, mostly with high education and travelling for 'tourism' have shown reasonable knowledge about malaria, even though some misconceptions remained and must be clarified, namely as regards malaria prevention and clinical presentation.

Poorer educated travellers seemed as those who can benefit the most from pre-travel health advice; female travellers combined with higher education and previous pre-travel health advice were associated with higher response quality, namely regarding clinical items. Information should be tailored to travellers, in order to fill the gaps of knowledge about malaria. The presence of information leaflets about malaria at the waiting room may serve as an important complement to medical advice. Easy-access, interactive IT platforms adapted to Portuguese travellers and reaching a wider number of travellers are crucial. Television, newspapers and magazines could also be important in disclosing knowledge about malaria, as long as accurate information is delivered. Travel medicine consultation is a privileged site to obtain information and clarification. A multifactorial approach is crucial for increasing knowledge about malaria, allowing for better prevention of the disease.

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HUMAN AND ANIMAL PROTECTION

The authors declare that the followed procedures were according to regulations established by the Ethics and Clinical Research Committee and according to the Helsinki Declaration of the World Medical Association.

DATA CONFIDENTIALITY

The authors declare that they have followed the protocols of their work centre on the publication of patient data.

CONFLICTS OF INTEREST

The authors declare that there were no conflicts of interest in writing this manuscript.

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