INFECTIOUS DISEASES

Attitudes and knowledge of the adult population on arboviral diseases

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Summary

Background. *Climate change and globalization have heightened the risk of vector-borne diseases (VBDs) in Europe, including Italy. VBDs cause over 1 billion cases and 1 million deaths annually, accounting for 17% of all communicable diseases worldwide. With competent vectors present, effective control measures and surveillance are vital. This study assessed adults' knowledge, attitudes, and practices regarding Arbovirus infections.*
Methods. *An 11-question survey targeting individuals aged 18 and over at the LHU Roma 1 vaccination clinic evaluated knowledge and experiences with Arbovirus diseases. Data were coded and analyzed.*
Results. *Of 308 participants, 58.1% were female, 63.65% had no*

children, and 84.1% held a degree or higher. Tick-Borne Encephalitis (TBE) was the most recognized disease (65.9%), followed by Zika (52.3%), while West Nile virus risk in Italy was underestimated (20%). Dengue awareness was high (91.6%), but Usutu awareness was low (47.4%). Vaccination was supported by 93.8%, with the 41-50 age group most willing to vaccinate children. Overall, knowledge of Arbovirus diseases was limited.
Conclusions. *Public awareness of VBDs and preventive measures must improve to support effective risk prevention strategies. Education campaigns are essential to address gaps in knowledge and promote informed decision-making.*

Introduction

In recent decades, viral diseases transmitted by arthropod vectors (insects with articulated legs) such as ticks, spiders, mites and mosquitoes, also known as Arbovirosis (acronym for ARthropod-BOrne virus), have consistently posed a significant threat to both public health and global development [1, 2]. There are currently over 100 viruses classified as arboviruses in nature that can cause disease in humans. [3] Among the main arboviral diseases that are emerging or have now become firmly established in our country, dengue stands out as an autochthonous disease, characterised by particularly deadly haemorrhagic symptoms, affecting around 390 million people and causing about 25,000 deaths each year [4]. Together, these diseases account for more than 17% of infectious diseases and cause more than 1 million deaths each year worldwide [5]. Although in recent years there has been an increase in the number of imported cases of mosquito-borne diseases also in Italy, there is still little public knowledge of this group of diseases.

In Italy, arbovirosis' prevention is mainly focused on disease surveillance and vector control, given the lack of specific vaccinations for most of these infections suitable with regard of epidemiological situation in the country. In fact, there are vaccinations for some arbovirosis that may be recommended for those living in areas where these diseases are endemic or for those travelling to tropical and subtropical areas. Tick-borne encephalitis vaccine

is recommended in several endemic regions in Europe, including a limited area in North-East Italy, while dengue and Japanese encephalitis vaccines are recommended for travelers in risk areas. Recently a Chikungunya vaccine has been authorized in Europe and its use is supposed to be also limited to travelers to endemic areas. Vaccination uptake by travelers is influenced by several factors, such as access to vaccination centres, sources of information and knowledge of travel-related risks, as well as social and individual factors such as attitudes and behaviour towards vaccines. Proper knowledge and perception of infectious risk are further important elements in the choice to vaccinate: some travelers' diseases may be considered irrelevant due to their low incidence, but it is important to prevent them due to their potential severity [6].

In this survey, the focus was on analysing the knowledge, attitudes and preventive practices of adults towards infections caused by Arbovirus. In particular, a 11-question questionnaire was constructed and addressed to citizens (target 18 - over 70 years) attending the LHU Rome 1 vaccination clinic, with the aim of measuring experience and knowledge of these diseases. Knowing people's perceptions and opinions on the risk related to mosquitoes' bites and their attitude towards preventing the spread of these vectors is of fundamental importance for designing communication initiatives aimed at risk prevention.

Materials and methods

This monocentric study was conducted on 308 participants aged 18 and over, recruited from those attending the UOC Vaccinations Outpatient Clinic of LHU Rome 1 during April and May 2024. A purposive and convenience sampling approach was adopted to quickly access a readily available population within the clinical setting; consequently, the sample size reflects the number of eligible participants available during the data collection period rather than being predetermined.

Data were collected using a self-administered questionnaire (Supplementary Material, Tab. S1) distributed via Google Forms, an online survey platform that ensured anonymous responses. The questionnaire was designed to maximize anonymity, with demographic information categorized on an ordinal or nominal scale. To facilitate access, Google Forms generated a unique survey URL that allowed participants to submit their responses anonymously. Within the vaccination clinic, the questionnaire was disseminated through a QR Code displayed on a poster (Fig. S1) at the centre's entrance, in compliance with the ethical authorization from the relevant health facility.

The Department of Experimental Medicine of the University of Salento acted as the data controller in accordance with current data protection regulations (EU Regulation 679/2016), as detailed in the introductory note of the questionnaire.

The study was approved by the Institutional Ethics Committee of LHU Rome 1, in accordance with the applicable ethical and legal standards.

On the first page (section) of the questionnaire, participants received information on the rationale and modalities of the survey. Only after understanding the purpose of the project and accepting the privacy terms were participants allowed to take part in the questionnaire. Respondents were not allowed to change their answers after submitting the questionnaire.

In terms of content, the questionnaire was divided into two sections and the number of questions in each section varied according to the objectives of the survey (questionnaire attached). In the first section of the questionnaire, socio-demographic information was collected; six questions were aimed at defining the characteristics of the sample surveyed (gender, age, family composition, number of children if present, educational qualification, and any specific data in relation to the survey), information that was useful for the final processing of the data.

The second section included 11 questions aimed at assessing the degree of knowledge and attitude the respondent reported having in relation to Arbovirosis diseases.

Results

A preliminary univariate analysis was conducted to describe the sample characteristics and distribution of key variables. The results showed that a total of 308 subjects took part in this study, with the most frequent age group being 31-40 years (27.6%) and a higher percentage of females (58.1%) compared to males (41.9%). More than half of the respondents reported not having children (63.65%), and the majority of respondents had a university degree or higher (84.1%) (Tab. I).

The most well-known disease was TBE (65.9%), followed by Zika (52.3%). Usutu was the least known disease. Only 20% of respondents thought they could contract West Nile Virus (WNV) in Italy (21.4%), while there was an overestimation of the risk for TBE (65.3%) (Fig. 1). Although all diseases mentioned can be contracted by travelers, the answers to the question "Which of these diseases do you think could be a risk for travelers?" were heterogeneous. The lowest risk perception was found for Usutu (47.4%) and the highest for Dengue (91.6%) (Tab. II).

Tab. I. Socio-demographic variables of the study population.

Socio-demographic variables	%	Frequency
Number of subjects		308
Gender (%)		
F	58.1%	129
M	41.9%	179
Age		
18-30 years	25%	77
31-40 years	27.6%	85
41-50 years	20.1%	62
51-60 years	17.9%	55
60-70 years	8.8%	27
Over 70	0.6%	2
How many people live in your family, including yourself?		
I live alone	18.5%	57
1-2 members	32.5%	100
3-4 members	41.9%	129
5-6 members	7%	21
> 6 members	0.3%	1
Are you a parent? If yes, how many children?		
No children	63.6%	196
1-2 children	33.1%	102
3-4 children	2.6%	8
> 4 children	0.6%	2
Are you currently pregnant?		
Yes	0	0
No	98.4%	303
I don't know	1.6%	5
What is your qualification?		
No instructions	0.3%	1
Only primary education, *e.g.,* primary school	0.3%	1
Secondary education, *e.g.,* secondary school, middle school	15.3%	47
Tertiary education, *e.g.,* university degree, vocational school	49.7%	153
Post-tertiary education, *e.g.,* master's degree, PhD	34.4%	106

Fig. 1. Frequency of answers to the question "Which of the following disease have you heard of?".
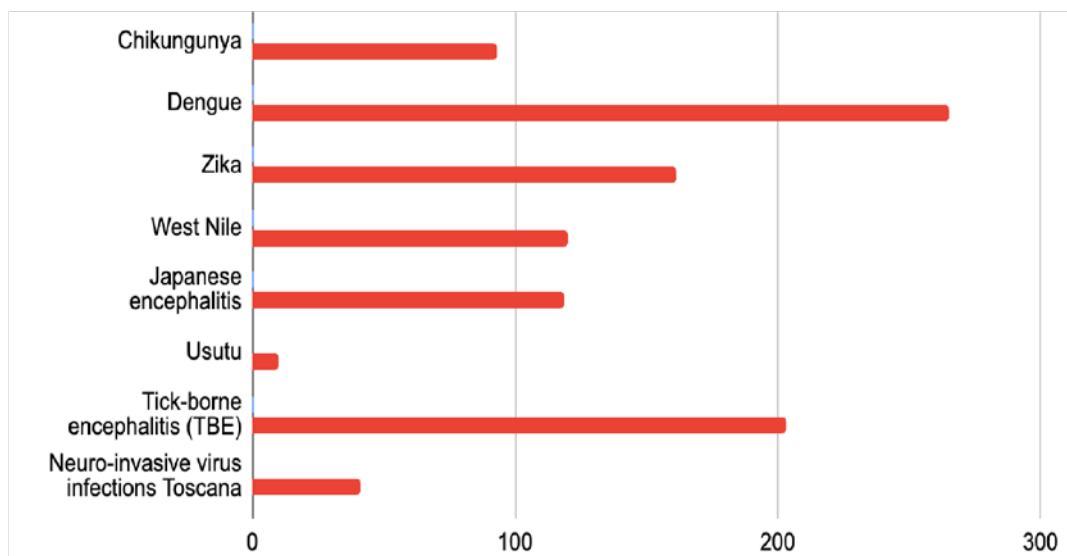
Tab. II. Perception of the risk of contracting arboviral diseases in Italy.

Which of these diseases do you think can be contracted in Italy?	%	Frequency
Chikungunya	16,6%	51
Dengue	55,5%	171
Zika	19,5%	60
West Nile	21,4%	66
Japanese encephalitis	8,4%	26
Usutu	4,5%	14
Tick-borne encephalitis (TBE)	65,3%	201
Neuro-invasive virus infections Toscana	60,7%	187

Univariate analysis showed a general positive attitude towards vaccination, with 93.8% of respondents

believing vaccines are important for their health and 64.4% considering repellents insufficient for protection against mosquito-borne diseases (Fig. 2). However, there was limited knowledge regarding arboviral diseases, as only 10 out of 308 respondents answered correctly about diseases that can be contracted in Italy, and no one answered adequately to the question "Which of the following diseases have you heard of?". Furthermore, 40.8% of respondents expressed uncertainty when answering the question "If you had or would have children, would you be willing to vaccinate them against Arbovirosis?" (Fig. 3).

From the statistical analysis, Pearson's chi-squared test revealed significant associations between the participants' age and their willingness to vaccinate children (Contingency Tabs. I, II). Specifically, participants in the 41-50 age group were more likely to
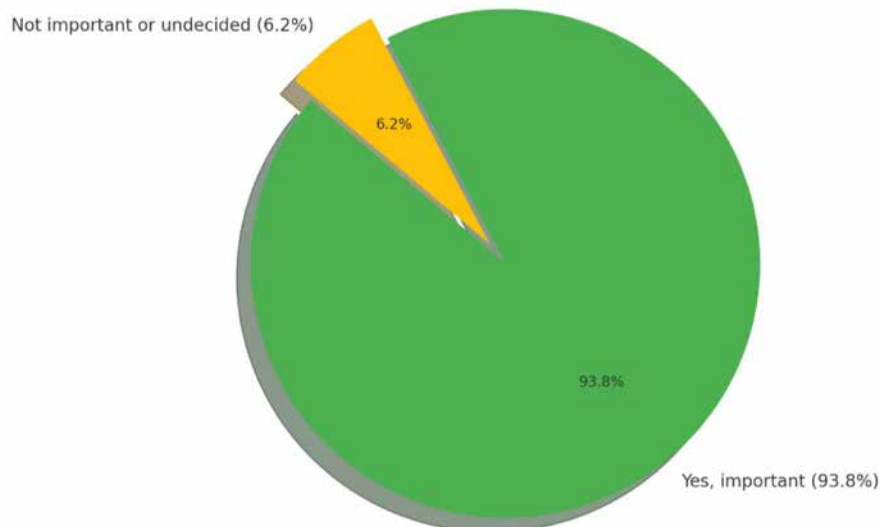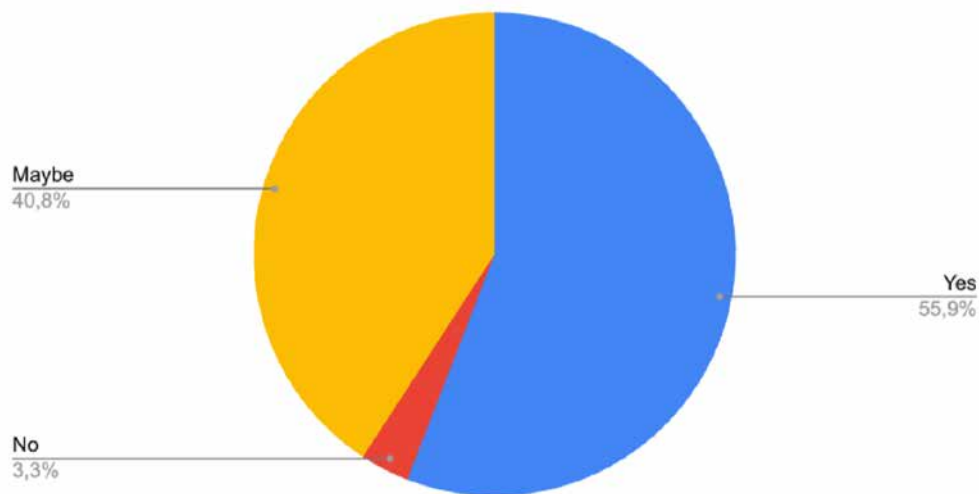
Fig. 2. Frequency of responses to the item: "do you think vaccines are important for your health?".

Fig. 3. Percentage of responses to the question: "if you had or had children would you be willing to vaccinate them against Arbovirosis?

vaccinate their children, regardless of whether they had children or not. In contrast, those with less knowledge about the risks were less likely to vaccinate their children. The analysis focused on assessing the independence between variables rather than causal relationships, as per the study's design. Multivariate analysis supported these findings, with associations confirmed through cross-tabulation (Tabs. III-VI).

Discussions

Vaccination acceptance is influenced by several factors including correct knowledge and perception of the infectious risk of diseases [9]. In the post-pandemic era, knowledge and attitudes towards traveler vaccination

Tab. III. Having Children x Age.

Age Group	No	Yes	Total
18-30 years	75	2	77
31-40 years	58	27	85
41-50 years	21	41	62
51-60 years	20	35	55
60-70 years	20	7	27
Over 70	2	0	2
Total	196	112	308

Tab. IV. Having Children x Age, Chi-Square Tests.

Statistic	Value	df	p-value (2-sided)
Pearson Chi-Square	82.546	5	< 0.001
Likelihood Ratio	96.574	5	< 0.001
N of Valid Cases	308		

a.2 cells (16,7%) have expected count less than 5. The minimum expected count is.73.

Tab. V. Knowledge of Arbovirus Risks x Willingness to Vaccinate.

Arbovirosis Risk Knowledge	Maybe	No	Yes	Total
Maybe	0	1	0	1
No	3	90	81	174
Yes	1	43	89	133
Total	4	134	170	308

Tab. VI. Knowledge of Arbovirus Risks x Willingness to Vaccinate, Chi-Square Tests.

Statistic	Value	df	p-value (2-sided)
Pearson Chi-Square	14.032	4	0.007
Likelihood Ratio	14.573	4	0.006
N of Valid Cases	308		

a.5 cells (55.6%) have expected count less than 5. The minimum expected count is.01.

has not yet been explored [10]. Although some travelers' diseases are to date considered irrelevant due to their low incidence, it is important to recognise and prevent them due to their potential severity. The present study presents the results of a quantitative survey on the knowledge, attitudes and preventive practices of a group of adult users belonging to the vaccination centre of a LHU in Rome, with regard to infections caused by Arbovirus. The use of a convenience sample comprising 308 participants represents a methodological choice driven by the practical constraints of the study period. However, it is important to note that the sampling strategy could have led to oversampling individuals with better knowledge of health-associated issues and higher acceptance of vaccines. Since the sample was selected from individuals attending a vaccination center, these participants were more likely to engage in preventive health behaviors, such as vaccination. While the sample is not representative of the general population, the

analysis still identified statistically significant trends in risk perception and vaccination intentions among sampled population. Nonetheless, we acknowledge that convenience sampling may introduce selection bias and limit the generalizability of our findings. Future studies would benefit from incorporating a preventive sampling strategy, including an a priori power analysis, to optimize sample representativeness and enhance the robustness of the conclusions drawn.

The analysis of the answers provided by the users to the questionnaires suggested several points for reflection. Despite West Nile being the most widespread arboviral disease in Italy, only a low percentage of the sampled population thought they could contract it without travelling. In fact, since the beginning of June 2022, 236 cases of WNV infection have been reported. Of these, 58 cases were diagnosed as encephalitis and 169 as West Nile fever [11].

On the contrary, the study shows a high perception of risk of TBE, which is, however, considered to be at low risk in Italy, *i.e.,* endemic in a limited area of the country and restricted exclusively to the north-eastern regions of Trentino Alto-Adige, Veneto and Friuli Venezia Giulia, with sporadic reports in Emilia-Romagna, Tuscany and Lazio. With regard to Zika, users also answer the questionnaire by overestimating the risks related to this disease. To date, Italy is to be considered a 'non-endemic area' for ZIKAV as only imported cases have been recorded [12]. Regarding the questionnaire question about the perceived risk of contracting arboviral diseases during travel, although all the diseases listed can be contracted by travellers, the responses were highly varied. This suggests a general lack of awareness about the incidence of arboviral diseases among the respondents. If this finding is confirmed in a larger population, it would highlight the need for strategies to raise awareness, potentially using a range of communication channels to reach a wider audience. In response to these findings, a guide was developed and published on institutional websites, providing general information on methods for preventing and combating arboviral diseases. This guide was drafted with the assistance of ChatGPT to ensure clarity and accessibility of the content (Fig. S2).

In relation to the attitude towards vaccination for arbovirus diseases, a good overall vaccination adherence was noted. Nevertheless, a large number of respondents expressed uncertainty when asked about the willingness to vaccinate their own children against arboviruses. This uncertainty may be partly attributed to the ambiguity of the question, "If you had or will have children, would you be willing to vaccinate them against arboviral diseases?". In particular, some infections, such as Zika, have direct implications for fetal health, which could lead parents to view the risks as more severe, while other infections, like West Nile fever (WNF), may not be perceived as dangerous for children. This distinction likely contributed to the uncertainty regarding vaccination decisions.

In addition, the analysis of the data shows little knowledge of the existence of all arboviral diseases,

even though the spread of viruses such as Dengue and Chikungunya has increased in recent years with outbreaks of local transmission even in some European countries, including Italy. Lack of knowledge about the diseases, and therefore a low perception of the related risks, could be among the determinants of the uncertainty to vaccinate their children.

Regarding the questionnaire question about the perceived risk of contracting arboviral diseases during travel, although all the diseases listed can be contracted by travellers, the responses were highly varied. This suggests a general lack of awareness about the incidence of arboviral diseases among the respondents. If this finding is confirmed in a larger population, it would highlight the need for strategies to raise awareness, potentially using a range of communication channels to reach a wider audience. In response to these findings, a guide was developed and published on institutional websites, providing general information on methods for preventing and combating arboviral diseases. This guide was drafted with the assistance of ChatGPT to ensure clarity and accessibility of the content (Fig. S2).

In relation to the attitude towards vaccination for arbovirus diseases, a good overall vaccination adherence was noted. A potential bias towards a general good attitude to vaccination may be due to the convenience sample selected among those attending a vaccination centre. Nevertheless, a large number of respondents expressed uncertainty when asked about the willingness to vaccinate their own children against arboviruses. This uncertainty may be partly attributed to the ambiguity of the question, "If you had or will have children, would you be willing to vaccinate them against arboviral diseases?". In particular, some infections, such as Zika, have direct implications for fetal health, which could lead parents to view the risks as more severe, while other infections, like Dengue, may not be perceived as dangerous for children. This distinction likely contributed to the uncertainty regarding vaccination decisions. In addition, the analysis of the data shows little knowledge of the existence of all arboviral diseases, even though the spread of viruses such as Dengue and Chikungunya has increased in recent years with outbreaks of local transmission even in some European countries, including Italy. Lack of knowledge about the diseases, and therefore a low perception of the related risks, could be among the determinants of the uncertainty to vaccinate their children.

It should be emphasized that, although our study identified some associations between variables, it was not designed to infer causal relationships. The test used only identified correlations between variables, without the possibility of establishing a direct cause-effect link. Therefore, while some associations between risk perception and the intention to vaccinate one's children were observed, these should not be interpreted as evidence of causality. Moreover, the use of multiple-choice variables in the questionnaire may have introduced limitations in the analysis, making it more difficult to accurately interpret participants' responses. Multiple-choice answers can complicate the assessment of individual intentions and

personal perceptions, as they do not always precisely reflect the priority or intensity of each opinion.

This methodological limitation should be taken into account when interpreting participants' knowledge and perceptions of arboviral diseases.

In the questionnaire, most users report having a university degree or higher; being a population with a high level of education, knowledge about arbovirosis has to be considered fragmented. Recent neuropsychological research supports this result, highlighting that individuals with a medium-high cultural level tend to have a low perception of risk. This is because they possess the cognitive tools to navigate the internet and read the information available. However, much of this information is often inaccurate. Paradoxically, it is precisely these individuals who are most exposed to the excessive, contradictory, and risk-laden information about vaccines that circulates online. Moreover, their social status often brings them closer to naturist approaches that tend to be against pharmacological treatments, particularly vaccines [13]. In the questionnaire, most users report having a university degree or higher; being a population with a high level of education, knowledge about arbovirosis has to be considered fragmented. Recent neuropsychological research supports this result, highlighting that individuals with a medium-high cultural level tend to have a low perception of risk. This is because they possess the cognitive tools to navigate the internet and read the information available. However, much of this information is often inaccurate. Paradoxically, it is precisely these individuals who are most exposed to the excessive, contradictory, and risk-laden information about vaccines that circulates online. Moreover, their social status often brings them closer to naturist approaches that tend to be against pharmacological treatments, particularly vaccines [13].

Descriptive statistics (age, gender, level of education, region of residence, *etc*.) were used to obtain the summary of the master data. For statistical analysis, the data was collected according to research ethics standards regarding the protection of personal data and exported from Microsoft Excel to be coded and analysed.

From the statistical analysis of the data, correlating the age of the parents to the willingness to vaccinate their children, a greater intention to vaccinate their children was detected only in the age group between 41 and 50; this data could be due to a greater level of concern among parents with young children, who generally belong to this age group in the Italian population.

The data were analyzed using Pearson's chi-squared test to examine the independence of categorical variables. This statistical test was appropriate for determining whether there were differences between the various classes of the population, as represented by the contingency tables (Tabs. III, IV). Due to the study design, the analysis was limited to identifying correlations between variables, and no causal inferences could be drawn. It is important to note that the use of multiple-choice questions may have introduced some limitations, complicating the interpretation of the

participants' intentions and perceptions. This approach could make it more challenging to assess the intensity or priority of individual opinions.

The data collected in this survey suggest the need to bring to light, at least in the context analysed, the doubts and perplexities of users about arboviral diseases, the preventive and contrasting measures available in Italy, to provide clear, complete, up-to-date, personalised information and thus facilitate an informed decision-making process.

Adherence to the vaccine offer must therefore be the result of a conscious choice based on knowledge, supported by adequate communication and attention to the specific information needs of the individual.

Although sources of information, knowledge of the risks of travel or mosquito-borne diseases, as well as social and individual factors such as attitudes and behaviour towards vaccines are at the basis of vaccination adherence, it remains to be considered that, unlike other routine vaccinations, counselling and vaccination services for arboviral diseases are not yet all available, and those that are available are subject to payment and paid for by the user. This element could be one of the factors hindering access to vaccinations, especially for travellers who are obliged to bear the cost of vaccinations even though they are more exposed to the risk of importing and spreading viruses, on their return from their trip, among non-immunised individuals and thus causing damage to public health. In fact, the attitude of Italian travellers to vaccinate themselves seems to be lower than that of other European populations, despite the similar proportion of trips made each year [14].

Furthermore, from the organizational point of view of LHU, the factors that could hinder the consultation process towards travelers are connected both to a delay in the approval of vaccines by pharmaceutical companies due to a probable unavailability of intermediate products, and to healthcare allocation unlimited national directly to avoid repercussions on the clinic due to budget disagreement.

The solution to the problem of travelers' vaccination hesitancy, therefore, needs to enter into the mechanisms of knowledge production, methods and public funding and, not least, the ways of building public opinion.

Conclusions

The survey has helped to provide useful information about the knowledge and attitudes of a sample of adults about vector-borne diseases and the protective behaviours they use.

Given the importance of public understanding of diseases in the adoption of effective protective behaviours, this study has shed light on the value of designing effective communication campaigns aimed at risk prevention, with the dual objectives of improving lay people's understanding of diseases and encouraging community participation in vector control.

Ethics approval and consent to participate

The study has been performed in accordance with the Declaration of Helsinki and has been approved by an independent ethics committee of LHU Rome 1. According to the protocol, the study was designed to be anonymous, and no personal identifiers were collected. Collection of data was performed via an online self-administered questionnaire that posed minimal stress to the participants. Data collected was exclusively related to personal opinion on arboviral diseases. Before accessing the questionnaire, a detailed information page was provided to the participants including ethical standards, privacy statements and assurance of confidentiality and voluntary participation. Access to the questionnaire was granted only after confirming that the information page was read, and consent was obtained by clicking on the checkbox.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and/or analyzed during the current study are available in the Figshare repository, accessible at the following DOI: 10.6084/m9.figshare.28062866. For additional information, please contact the corresponding author at valeria.gabellone@unisalento.it.

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Conflicts of interest statement

The Authors declare that they have no competing interests.

Authors' contributions

FN contributed to the conception and design of the work, to the interpretation of data, and wrote the first draft of the manuscript. VG contributed to the design of the work, to the analysis and interpretation of data, and substantially contributed to the manuscript. SC contributed to data interpretation and revised the final version of the manuscript. LB contributed to data interpretation and revised the final version of the manuscript. PL contributed to the conception and design of the work, to the interpretation of data and substantially revised the manuscript. All Authors revised and approved the final version of the manuscript.

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Supplementary material

Tab. S1. Questionnaire on Knowledge and Attitudes towards Arbovirosis Diseases.

I understand the purpose of the project and accept the privacy terms - I agree - I do not accept
Gender - Male - Female
Age - Less than 17 years - 17-30 years - 31-40 years - 41-50 years - 51-60 years - Over 60 years old
How many people live in your household, including yourself? By household we mean the number of people (including yourself) living at the same address, sharing a kitchenette and living, sitting or dining area - I live alone - 1-2 members - 3-4 members - 5-6 members - >6 members
Are you a parent? If yes, how many children (under the legal age) do you have? - No children - 1-2 children - 3-4 children - >4 children
Are you currently pregnant? If FEMALE is selected in D1: - YES - No - Don't know
What is your educational qualification? - No education - Only primary education, *e.g.*, primary school, primary school - Secondary education, *e.g.*, secondary school, middle school - Tertiary education, *e.g.*, university degree, vocational school - Post-tertiary education, *e.g.*, master's degree, PhD
Arbivorous diseases:
1. Which of the following diseases have you heard of? a) Chikungunya b) Dengue c) Zika d) West Nile (e) Usutu (f) Tick-borne encephalitis (Tbe) (g) Neuro-invasive infections with Toscana viruses
2. Which of these diseases do you think can be contracted in Italy? a) Chikungunya b) Dengue c) Zika d) West Nile e) Usutu (f) Tick-borne encephalitis (Tbe) (g) Neuro-invasive virus infections Toscana
3. Which of these diseases do you think could be a risk for travellers? a) Chikungunya b) Dengue c) Zika d) West Nile e) Usutu (f) Tick-borne encephalitis (Tbe) (g) Neuro-invasive virus infections Toscana

▶

Tab. S1 (*follows*). Questionnaire on Knowledge and Attitudes towards Arbovirosis Diseases.

4. Did you know that mosquitoes can transmit diseases? a) Yes b) No c) Maybe
5. Do you think repellents are enough to protect you from Arbovirosis? a) Yes b) No c) Maybe
6. If you were offered a vaccine against Arboviral Diseases would you vaccinate? - Yes I have full confidence in vaccines - Yes I have some confidence in vaccines - Yes, but I am hesitant about these new vaccines - I don't know - No, but I am willing to learn about this vaccine - No, I don't think it's necessary - No, I am strongly against having the vaccine
7. If you had or would have children, would you be willing to vaccinate against Arbovirosis? a) Yes b) No c) Maybe
8. Do you know the health risks caused by mosquito-borne diseases other than Arbovirosis? a) Yes b) No c) Maybe
9. Do you consider vaccines important for your health? a) Yes b) No c) Maybe
10. Do you know that there are vaccines approved by AIFA and available in your ASL against certain mosquito-borne diseases? a) Yes b) No c) Maybe

Fig. S1. Leaflet with QR Code available to users of the Vaccination Service.

Fig. S2. Vademecum on Arbovirosis Diseases.

Vademecum on Arbovirosis Diseases

Arbovirosis diseases are caused by viruses transmitted by insects, such as mosquitoes or ticks. Examples include dengue, Zika virus and West Nile virus. To prevent these diseases, it is advisable to use insect repellents, wear protective clothing and avoid infested areas. In addition, it is important to empty containers of stagnant water that can act as breeding grounds for mosquitoes.

Always consult a doctor for specific information on the prevention and treatment of these diseases.

In Italy, the prevention of arboviruses, diseases transmitted by arthropod vectors such as mosquitoes and ticks, focuses mainly on surveillance and reducing exposure to vectors, given the lack of specific vaccinations available for most of these infections. The arboviruses receiving particular attention include Chikungunya, Dengue, Zika, West Nile, Usutu, tick-borne encephalitis (TBE) and neuro-invasive Toscana virus infections, with West Nile being the most widespread. Recommended preventive measures include the use of repellents, protective clothing and mosquito nets, as well as the removal of standing water to limit mosquito breeding 【5†source.

Although there are no vaccines available for most of the arboviruses in Italy, there are vaccinations for some tick-borne diseases, such as tick-borne encephalitis (TBE), that may be recommended for those travelling or living in areas where these diseases are endemic. This approach aligns with the National Plan for Prevention, Surveillance and Response to Bluetongue (NAP) 2020-2025, which emphasises prevention through surveillance and vector control measures 【7†source】.

For more information on available vaccinations and specific recommendations, it is advisable to consult directly the official sources of the Italian Ministry of Health or local health authorities, as well as the dedicated pages on their websites 【6†source】.

Here is a general vademecum for the prevention of arboviral diseases:

1. **Protect yourself from mosquito bites:**

- Use insect repellents containing DEET, picaridin or eucalyptus citriodora oil.

- Wear long-sleeved clothing, long trousers and closed footwear when in mosquito-infested areas. - Use mosquito nets in windows and doors to prevent insects from entering.

2. **Avoid high-risk areas:**

- Find out about geographical areas at risk of arboviral disease transmission and avoid non-essential travel to these

areas during periods of increased mosquito activity.

3. **Eliminating potential mosquito breeding sites:**

- Regularly empty containers of standing water such as pots, buckets or gutters to prevent the proliferation of

mosquitoes.

- Cover or empty outdoor water containers, such as buckets, to prevent them from becoming stagnant.