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ORIGINAL ARTICLE

Advances in Basic Medical Sciences

Insight into use and safety of mosquito repellents; an online survey

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ABSTRACT

OBJECTIVE: To evaluate the public knowledge, attitude and awareness regarding safe use and side effects of commercial and natural mosquito repellents.

METHODOLOGY: An online survey was conducted using a twelve questions questionnaire created on google forms. Public awareness about mosquito repellents and their safe use and side-effects was assessed. The data was collected anonymously using social media platforms. The form was distributed using social media among individual. We got 278 responses for the questionnaire. The survey results were downloaded from google forms in the Excel spread sheet. Results were presented in the form of percentages.

RESULTS: The results showed that 86% of the respondents used commercial mosquito repellents while 61% of the participants did not have idea about natural mosquito repellents. 63% respondents were using commercial mosquito repellents in well-ventilated space and for 6-8 hours duration.75% were females who suffer from any kind of side effects after use of mosquito repellents in which 58% were allergic reaction due to mosquito repellents while 61% of the respondents have headache following use of mosquito repellents.

CONCLUSION: It is concluded from this survey that mosquito repellents can cause some adverse effects in general public. Therefore, people should practice using these repellents in well-ventilated space up to 6-8 hours duration of time. Public health interventions are needed to minimize exposure to mosquito repellents and public awareness programs should be conducted.

KEYWORDS: Mosquito repellents, toxicity, mosquito control, allergic reaction.

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INTRODUCTION

Mosquitoes poses a major risk to public as a mean to transmit many deadly diseases such as Malaria, Yellow fever and Dengue fever. Mosquitoes as a mean for transmission of viruses and parasites, are responsible for death of millions of people every year. ''. Many ways are adapted by people all over the world to directly target the mosquitoes. These different methods comprise the use of mosquito repellent coils, liquid vaporizers, sprays and mats. These repellents affect the host searching mechanism of mosquitoes by blocking their olfactory receptors and have some adverse effects on humans.

In many tropical regions of the world, people use plant-based repellents as a natural method to keep mosquitoes away. Many plant extracts or essential oil are used against many species of mosquitoes.'' Different parts of plants such as leaves, stem , bark and extracts are used by people as mosquito repellents.

It has been reported that commercial mosquito repellents are associated with increasing the oxidative stress, disturbing the redox status, thus affecting many systems of the body. Some chemicals in these artificial mosquito repellents are able to cross the blood brain barrier, leading to some neuronal dysfunction such as nervousness, anxiety and tremors.

There is very limited literature available focusing solely on public knowledge, attitudes, and awareness regarding the safe use and side effects of mosquito repellents in Pakistan. Several studies conducted on attitude of public regarding Dengue fever and malaria in different regions of Pakistan provide relevant understandings of preventive practices against mosquitoes.

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These studies revealed that majority of people prefer mosquito repellent sprays to prevent mosquito bites.

It was observed by Abhijit V Bortane et al; in India that majority of participants uses some personal protective measures against mosquitoes. Another study in India showed that 7.7% of individuals suffered from headache while some participants experienced allergic rhinitis, sore throat and eye irritation due to usage of mosquito repellents.' Maie and Moore observed a higher preference towards natural plant based mosquito repellents in Malaysia considering them a safe alternative of commercial mosquito repellents

From all these studies, it is proposed that the people of Pakistan are generally aware of mosquito repellents as important measure against mosquitoes, there is limited knowledge towards the safe use and associated side effects of mosquito repellents. The objectives of this survey were to determine the public attitude regarding safe use of mosquito repellents and their knowledge about commercial and natural mosquito repellents as well as their side effects. This survey will help in identifying routine human practice of using mosquito repellents and if they suffer any side effects. The findings of this study will help general public and researchers to identify most effective mosquito repellent with least side effects to improve preventive practices.

METHODOLOGY

Design of the study

Cross-sectional survey study

Sample

Convenience sampling was used to conduct the survey and sample size calculated using Survey Monkey sample size calculator was 278 with 95% confidence interval –

Procedure

An online survey was conducted using a twelve questions questionnaire created on google forms. Demographic variables included gender and age. Public awareness about mosquito repellents and different kinds of mosquito repellents such as natural and commercial mosquito repellents was assessed. Also, people's knowledge about safe use of different types of aerosol or smoke based commercial mosquito repellents was checked through this online survey. Three questions were specifically designed to assess the side-effects of different mosquito repellents, any allergic reaction or headache due to use of these mosquito repellents.

Data collection

The data was collected using social media platforms. Questionnaire was generated using google forms and collected anonymously. The form was distributed using social media among individual. We got 278 responses for the questionnaire.

Data analysis

The survey results were downloaded from google forms in the Excel spread sheet. Results were presented in the form of percentages and Chi square test was used to find any association between qualitative variables.

RESULTS

278 individuals participated in our survey. Gender and age of the survey respondents are shown in figure 1 in which 27% were males and 73% were females. Most respondents were between 18-28 years followed by 29-38 years and then 39-48 years. (Figure 1)

The knowledge of respondents about different kinds of mosquito repellents such as commercial or natural mosquito repellents and use of these mosquito repellents was assessed, and we found out that 75% of the total participants uses mosquito repellents and 60.9% of the participants were not familiar of the natural mosquito repellents. 86% of the respondents were using commercial mosquito repellents while use of natural mosquito repellents was reported by 7% of the participants.

There are different types of commercial mosquito repellents. The most common repellents method chosen by the participants was mosquito coil and liquid vaporizer followed by repellent spray. Only 6% of the respondents uses mats as shown in Figure 2.

According to National Environmental Agency guidelines, spatial mosquito repellents should be used in well-ventilated areas and not for more than 8 hours. From our survey we found that 63% of the participants uses commercial mosquito repellents in well-ventilated spaces.Majority of the respondents i-e; 53% uses these repellents for 6-8 hours while 15% uses them for 8-10 hours. 8% of the respondents uses it for 10-12 hours while 24% responded that they use them for some other duration.

When we analyzed the results of side effects of mosquito repellents, we found that 75% were females who suffered from any kind of side effects after use of mosquito repellents. Majority of them i-e; 58% were between 18-28 years of age followed by 29-38 years which makes 34%.

We found that 35% of the participants who suffered side effects used repellent spray, 30% used mosquito coil, 27% used liquid vaporizer and 8% used repellent mats. It was revealed that 63% of the respondents used these mosquito repellents in well-ventilated space. 59% of them were using these repellents for 6-8 hours while 18% were using them for 8-10 hours.

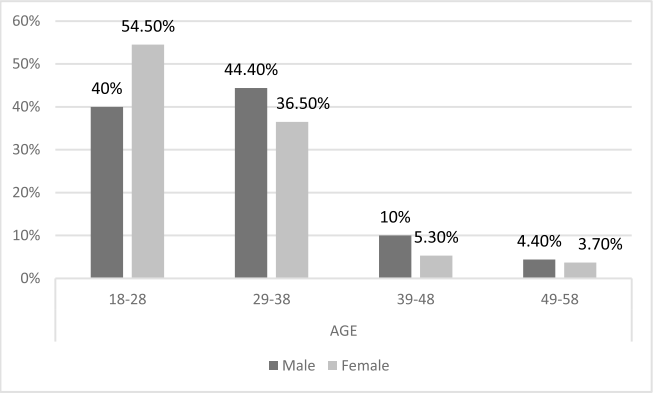

Figure 1: Showing gender and age of participants

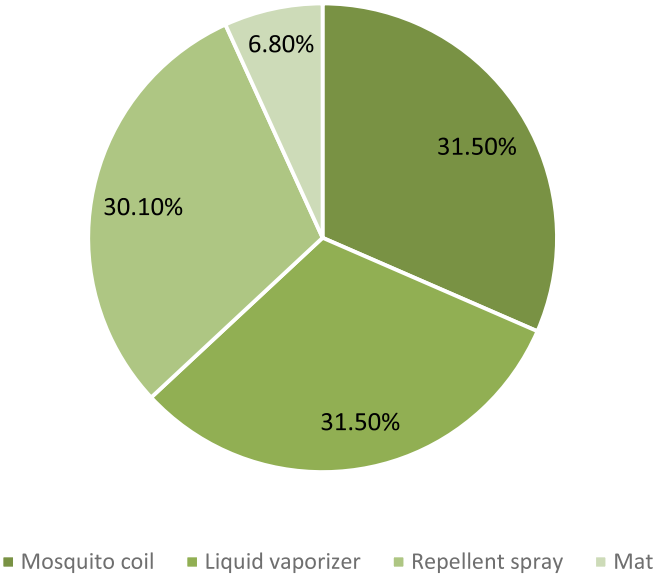

Figure 2: Type of commercial mosquito repellent used

Table 1 shows side effects such as headache and allergic reaction due to use of mosquito repellents. Most of the participants reported headache (33%) and allergic reaction (28%) due to use of mosquito coil followed by liquid vaporizer.

DISCUSSION

Mosquito repellents are widely used by the public to protect themselves from mosquitoes. Different types of mosquito repellents are used by people living in tropical areas and majority of people are using these repellents in closed vicinities.

Our survey showed that majority of respondents uses repellent sprays considering it a safe alternative to mosquito coil. Our findings are in accordance to the study conducted by Abdulaziz A et al. which showed that mosquito coil is associated with more adverse effects on respiratory system as compared to aerosols of liquid repellents.

Emil.J et al., has shown that when there is a rise in indoor pollution, it is associated with toxic effects on trachea and lungs. In our survey majority of respondents were practicing using mosquito repellents in well-ventilated spaces for the duration of 6-8 hours.

A lot of adverse health effects are associated with the use of these repellents indoor. These effects are irritation of eyes, throat and oral mucosa as shown by Karim et al. Our survey also showed that majority of the participants suffered from the side effects of mosquito repellents. The findings of our survey are also in accordance to the Fu et al., where burning of incense leads to alleviating allergic symptoms.

It has been found in this study that 58% of the participants suffered from some types of allergic reaction due to exposure to mosquito repellents. It has been found in the literature that these mosquito repellents are associated with some allergic effects such as nasal congestion, runny nose, cough and even more severe symptoms in asthmatic patients. Although if there is proper ventilation, some residues remain suspended in the air leading to allergic response.–

Results of our survey has shown that most of the participants suffered from headache following the use of mosquito repellents. Tietjen et al. and Garg et al. have explained that increase in toxic materials such as polyaromatic hydrocarbons, carbon monoxide and particulate matter in closed surroundings is associated with a rise in oxidative stress, thus leading to neuroinflammation, ultimately resulting in headache.–––

We observed in our survey that very little participants have knowledge about natural mosquito repellents. It has been reported by Almeida. et al. that natural mosquito repellents can be a safe alternative to commercial mosquito repellents and these natural mosquito repellents are effective as well.

CONCLUSION

Limitations:

This survey did not represent broader population due to limited

Side effects	Mosquito coil N=97	Liquid vaporizer N=95	Repellent spray N=69	Mat N=18	Total 279
Headache	32(33%)	26(27.3%)	21(30.4%)	6 (33%)	85 (30%)
Allergic reaction	27 (28%)	27(28.4%)	16 (23.1%)	5 (27%)	75 (27%)

Table 1: Showing side effects caused by using different mosquito repellents

resources and time. There was also response bias as those with poor internet connection failed to respond.

Conclusions

It is concluded from this survey that mosquito repellents can cause some adverse effects in general public. People should practice using repellents in well-ventilated space up to 6-8 hours duration of time. Public health interventions are needed to minimize exposure to mosquito repellents. Work must be done to identify some safe alternative of these harmful mosquito repellents. Awareness programs among general public should be arranged about natural mosquito repellents and safe use of both commercial and natural mosquito repellents.

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CONFLICT OF INTEREST

Author declared no conflict of interest

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AUTHORS CONTRIBUTIONS

QUA: Conception, Design of the work, Data collection, and Drafting, Reviewed, Final approval, Agreement to be accountable.

ZH: Conception, Design of the work, Acquistion, Data Analysis, and Drafting, Reviewed, Final approval, Agreement to be accountable.

WH: Conception, Design of the work, Interpretation of data for the work, and Drafting, Reviewed, Final approval, Agreement to be accountable.

HR: Conception, Design of the work, Data collection, and Drafting, Reviewed, Final approval, Agreement to be accountable.

DATA SHARING POLICY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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