



Publisher homepage: www.universepg.com, ISSN: 2663-7529 (Online) & 2663-7510 (Print)

<https://doi.org/10.34104/ejmhs.022.01220129>

European Journal of Medical and Health Sciences

Journal homepage: www.universepg.com/journal/ejmhs

European Journal of
**Medical and
Health Sciences**



Knowledge and Attitude of the Community People on Indoor Residual Spraying (IRS) Program at Kala-azar Endemic Area in Bangladesh

Ha-mim Md. Shahriar Azam^{1&3*}, Farjana Sharmin², and Fatema-Tuz-Zohra²

¹Dept. of public Health, ASA University, Bangladesh; ²Dept. of Public Health, North South University, Dhaka, Bangladesh; and ³CSBF Health Center, Bijoy Shoroni, 109 Bir Uttam Ziaur Rahman Road, Dhaka, Bangladesh.

*Correspondence: shariarazam@gmail.com (Ha-mim Md. Shahriar Azam, Chief Operating Officer, CSBF Health Center, Bijoy Shoroni, 109 Bir Uttam Ziaur Rahman Road, Dhaka, Bangladesh).

ABSTRACT

Visceral leishmaniasis also known as kala-azar is a chronic and potentially fatal parasitic disease in the world, affecting mainly the underprivileged people in the world. The success of the Kala-azar elimination program is mostly dependent on community participation which is an important aspect implemented by the world health organization in five south Asian countries. The participation of the community people mostly depends on the level of knowledge, attitude, and practice around risk factors associated with disease transmission among the population. This study was undertaken to assess the level of knowledge and attitude of the community people towards the indoor residual spraying (IRS) program in the Kala-azar endemic area. The study was carried out in 240 households by systemic random sampling on both hyper and moderate endemic areas in Bangladesh, and information was collected through a semi-structured questionnaire. Data from the study indicated that 44.6% of participants were illiterate, 99% had heard of kala-azar and 100% had heard about IRS. Team of IRS, family members, and neighbors play an important role as a source of information while the role of mass media was found to be limited. Almost all respondents who participate here seem to be that kala-azar is a serious health condition that drains family resources, but their attitude to doing beneficial activities of the IRS is not satisfactory because of their thought that it could be controlled by community effort. From the data, it is seen that people are knowledgeable about kala-azar, but disease transmission, infection origin, and control of the diseases are still not adequate. Their attitude toward indoor residual spraying program practice was not satisfactory. These findings suggest that it is necessary to continue and strengthen behavioral change through the implementation of the IRS program to progress the disease's condition in the pandemic areas of Bangladesh.

Keywords: Kala-azar, Tropical diseases, Indoor Residual Spraying (IRS), Attitude, and Endemic area.

INTRODUCTION:

Kala-azar also known as black fever is a vector-borne parasitic disease caused by a protozoan called *Leishmania donovani*. It is one of the most neglected and poverty-related diseases in the world, causing more than 50,000 deaths each year worldwide (Desjeux P, 2004). It is also seen that the majority of the people

who are living in the endemic areas of Kala-azar have low levels of education, income, and poor quality of housing (Ahluwalia *et al.*, 2003). Kala-azar is spread over a large geographical area across the globe with an estimated yearly incidence of 500000 cases, which leads to the loss of nearly 2.4 million disability-adjusted life years (DALYs) each year. The diseases

are endemic in 88 countries of the world and over two hundred million persons are at risk in Africa, Latin America, South and Central Asia, the Mediterranean basin, and the Middle East (Stauch *et al.*, 2011). It is also endemic in 115 districts spread over these four countries, namely India (52), Bangladesh (34), Nepal (12), and Bhutan (6) (Singh *et al.*, 2011). Over sixty percent of the Kala-azar or *Visceral leishmaniasis* (VL) in the world is stated from India, Nepal, and Bangladesh only (Habib *et al.*, 2014). In Bangladesh, 20 million people (18% of the population) are considered to be at risk for VL, with 4000 – 9000 patients identified annually in facility-based surveillance (DGDA 2008). The disease is endemic in 34 districts of Bangladesh. Mymensingh, Tangail, Jamalpur, Gazipur, Sirajganj, Pabna, Nator, Naogaon, and Nawabgonj are the nine most endemic districts for kala-azar, among these districts Mymensingh bearing the heaviest burden. In this country, at least 5 upazilas in Mymensingh district have the highest kala-azar burden. Here the majority of the disease-stricken population cannot afford the appropriate health care services because of lack of easy diagnostics and suitable drugs. Passive surveillance for kala-azar has been continuing since 1994 by the Directorate General of Health Services (DGHSs), Bangladesh. Currently, several factors have created a smooth road for achieving the goal of eliminating VL from the South East Asia Region (SEAR) (Islam *et al.*, 2021; Mondal *et al.*, 2008).

India, Bangladesh and Nepal have demonstrated strong political principles and commitment for the eradication of black fever by signing a memorandum of understanding (MoU) during the World Health Assembly in Geneva in 2005 (Communicable Disease 2011). The aim of this Tripartite MoU was to co-operative upgrade the health status of susceptible groups and the risk population living in kala-azar prevalent zones of Bangladesh, India, and Nepal by the extinction of kala-azar so that diseases will no longer be a public health problem (Shah *et al.*, 2020; DGDA 2012).

For the elimination of Kala-Azar, the major strategies given by the world health organization (WHO) is effective disease surveillance, initial diagnosis and treatment, effective vector control, social mobilization, and clinical and operational research. One of the main strategic pillars of the VL elimination program is

integrated vector management. It can be used individually or in combination. There are several vector control tools such as indoor residual spraying (IRS), long-lasting insecticide treated nets (LNs), and environmental vector management (EVM). To make the elimination program successful, enhancing social mobilization is essential and building capacity to span the key areas like organizational development and workforce development. Based on indoor residual spraying (IRS) large-scale control programs are cost-effective for local eradication of domestic vectors and interruption of Kala-azar transmission in different parts of the world. Nevertheless, IRS was recommended as the key vector control strategy in 2005. Under carefully controlled conditions indoor residual spraying (IRS) programs are found to be particularly efficacious, causing a 72.4% reduction in sand fly densities (Chowdhury *et al.*, 2011). The success of the national VL elimination program is not possible without the dynamic contribution of the community. It also depends on the response of community members to early diagnosis and treatment, treatment-seeking behavior, knowledge of indoor residual spraying programs, and reduction of human vector contact. Therefore, the aim of this study was to find out the knowledge and attitude of the community people about the indoor residual spraying (IRS) program in the kala-azar endemic area to make the national kala-azar elimination program more effective and successful in Bangladesh.

METHODOLOGY:

Study design

The study was undertaken for the purpose of assessing the IRS program-related knowledge and attitude of the community people in the Kala-azar endemic area. Data has been collected from the hyper and moderate endemic areas in Mymensingh and Gazipur districts, Bangladesh.

Sampling and data collection

A multistage systematic selection method has been adopted for the participation of 240 households. According to national guidelines in Bangladesh, high and moderate kala-azar incidences are found at the Upazilla level. There are 8 kala-azar hyper endemic and 10 temperately endemic districts in Bangladesh. Hyper and moderate endemic areas of Mymensingh and Gazi-

pur districts were selected randomly for data collection. From each area, 120 houses were carefully chosen through systemic random sampling from the random table on the basis of the existing Geographical Reconnaissance (GR) of those villages.

Data processing and analysis

A total of 240 respondents were interviewed from the selected houses through a semi-structured questionnaire and face-to-face interview. Semi-structured questionnaires and consent forms were prepared in English and were translated into Bangla.

Table 1: Socio-demographic characteristics of the Respondents (n = 240).

Socio-demographic characteristics	Category	Respondent number	Percentage (%)
Age	18-38 years	101	42.1
	39-59 years	108	45.0
	60-80 years	31	12.9
Sex	Male	148	61.7
	Female	92	38.3
Religion	Muslim	236	98.3
	Hindu	4	1.7
Occupation	Agriculture	80	33.3
	Business	54	22.5
	Service holder	21	8.8
	Housewife	79	32.9
	Student	6	2.5
Education level	illiterate	107	44.6
	Primary	60	25.0
	Secondary	53	22.1
	Graduate	20	8.3
Monthly income (tk)	1500 – 9600 (tk)	166	69.2
	9700 – 45000 (tk)	74	30.8
Monthly expend (tk)	1500 – 9600 (tk)	203	84.6
	9700 – 40000 (tk)	37	15.4
Type of house	Mud	53	22.1
	Tin	73	30.4
	Thatched	7	2.9
	Brick un-plaster	32	13.3
	Brick plaster	75	31.3
Room number	1-4 room	202	84.2
	5-12 room	38	15.8
Family member	1-5 member	171	71.3
	6-15 member	69	28.8

The data was checked and verified daily and audited for errors and inconsistencies. All the results were calculated with the help of a computer by using the SPSS-16 program. Data was presented according to the information given by the participants.

Ethical consideration

Ethical consideration is an integral aspect of research that needs to remain at the forefront of our work. So, it should be equally given due respect in any research. Written consent was taken from the participants and verbal approval from community leaders was taken for gathering the data. The information given by the respondent was used to concentrate the data of this study

by maintaining the confidentiality and hoping that it would not be detrimental to their lives. The study and consent form were approved by the national ethical board and also the ethical board of the ASA University, Dhaka, Bangladesh.

RESULTS:

Socio-demographic characteristics of the respondents

The study selects ten demographic characteristics for exploring the demographic analysis so that the attitude about health care can be understood clearly. The selected characteristics are age, sex, religion, occupation, education, expenses, house type, room number, and

family members as the core demographic characteristics since the patients are living in kala-azar endemic areas (Table 1). The highest number (45%) of the respondents came from the age group of 39 – 59 years. While a considerable number (42.1%) of the respondents belong to the age group of 18 – 38 years, only 12.9% are over 60 years of age. A significant number (44.6%) of people who participated in this study were not educated or had no ability to read or write. About one-fourth of the respondents passed their primary education, 22.1% completed secondary education, and 8.3% completed higher education. This study has been conducted in urban areas, therefore the highest number of respondents were former having a percentage of 33.3%, while 32.9% were housewives, 22.5% were businessmen, 8.8% were service holders, and 2.5% were students. The data shows that 69.2% of the respondents have a monthly income of 1500 to 9600 taka, while 30.8% have 9700 to 45000 taka. According to income, their monthly expenses are also the same as the first group, although their percentage is slightly higher at 84.6%. Greater than half of the respondents belong to nuclear families. On the other hand, 71.3% of the families had family members of 1–5 people, and 28.8% of the respondents had family members of 6–15 people. In this study, it was also seen that the highest number of the participants were Muslim which were 98% and 1.4% were Hindu.

Information about healthcare-seeking behavior

The selected information-seeking behavior before and after the kala-azar program is determined by some of the indicators such as kala-azar, IRS, sources of information, IRS program, knowledge about other programs, and information source about IRS program (Table 2). From the data, it was seen that around 99% of the respondents heard about Kala-azar and 1% had not heard about it. But interestingly all the participants (100%) hear about IRS, while 89.6% had heard about IRS from the IRS operating team, and 5.8% and 4.6% of applicants heard about IRS from neighbors and family members respectively. All of the respondents heard about the last IRS program among those 65% knew about other methods that reduce kala-azar and the rest of the respondents (35%) did not know about it. One hundred sixty-three (39%) respondents knew about mosquito coils to reduce kala-azar. One hundred fifty-four (36.8%) respondents and one hundred one (60.5%) respondents knew about environmental management (EVM) and insecticide treated nets (ITN) to reduce Kala-Azar, respectively. The media (print and electronic) have a great role in announcing national programs from which people can learn about and take advantage. But data shows that a large number of respondents are known about the IRS from direct participants in the IRS program 1.3% from TV, 0.8% from radio, 0.4% from health care, 1.8% from print media, and community village meetings (0.3%).

Table 2: Respondents and sources of information about kala-azar and its control program (n = 240).

Information seeking behavior	Category	Respondent	Percentage (%)
Kala-Azar	Heard	240	99
	Non-heard	0	1
IRS	Heard	240	100
Heard about IRS	From IRS team	215	89.6
	From family member	11	4.6
	From neighbor	14	5.8
IRS Program	Last program	240	100
Know about other methods	ITN	101	60.5
	mosquito coil	163	97.6
	EVM	154	92.2
Source of information about IRS execution	Radio	2	0.8
	TV	3	1.3
	Health care	1	0.4
	Directly come	240	100
	Printing Media	0	1.8
	Community and village meeting	0	0.3

Participant responses to taking health care benefits

The study identified some indicators of facing challenges during healthcare facilities, such as removing or covering before IRS execution; cleaning after IRS execution; suggestions for improving IRS; wanting to continue IRS suggestion; thinking IRS benefit; entering house after spray; painting or plastering or cleaning after IRS; and removing or covering before IRS (Table 3). During the last program, the IRS was done in all households. Therefore, 83.3% of the respondents indicated that they knew about removing or covering animals from cattle sheds before IRS execution, 85.8% and 99.6% of the respondents indicated that they knew about removing and covering clothes and food before IRS execution, respectively. They also know that exclusion of children is necessary before IRS execution. Approximately half of the respondents (52.9%) stated that they were aware of sprayed not over the bed and pillow, 60.4% not over the floor, 70% not over the curtain, and 100% of food containers and water jars. Interestingly a significant amount of the respondents (77.1%) know the time for waiting to enter the house

after IRS execution. The least number of respondents (19.6%) revealed that they know the time for waiting to enter the house within 2 hours of IRS execution, and very few (3.3%) of the respondents revealed that they know the time for waiting to enter the house after 2 hours of IRS execution. After IRS execution cleaning is an important factor. Nevertheless, 77.1% of the participants don't know about the cleaning after IRS execution, 6.3% know about the following day, 8.8% know it will be within 2 – 6 days, 5.8% know it will be within 7 days to 1 month, and varying small percentages of the population 2.1% know it will be about 1 month to 6 months, respectively. Two hundred four (85%) participants agreed they did not get advice for painting, plastering, or cleaning after the IRS was executed by the IRS team, and the rest of thirty-six (15%) participants got advice. Two hundred eleven (87.9%) respondents wanted to continue the IRS program, but twenty-nine respondents (12.1%) did not want it. The majority of the respondents (91.3%) thought the IRS was beneficial for the community village, but 8.8% of the respondents did not.

Table 3: Distribution of respondents according to use of preventive practices for control of kala-azar (n = 240).

Responses	Category	Respondent number	Percentage (%)
removing/covering before IRS execution	Cloth	206	85.8
	Food	239	99.6
	Child	240	100
	Animal	200	83.3
Clean after IRS execution	That day	15	6.3
	2-6 days	21	8.8
	7 days-1 month	14	5.8
	After 1 month-6 month	5	2.1
	don't know	185	77.1
Suggestions for improving IRS	no comments	79	32.9
	regularly sprayed	22	9.2
	spot in furniture	7	2.9
	more training	16	6.7
	announced before	35	14.6
	IRS related information	57	23.8
	better medicine	7	2.9
	bad smell	3	1.3
Want to continue IRS suggestion	more careful	14	5.8
	Yes	211	87.9
Think IRS benefit	No	29	12.1
	Yes	219	91.3
Enter house after spray	No	21	8.7
	Yes	50	20.8
Paint/plaster/clean after IRS	No	190	79.2
	Yes	36	15
	No	204	85

Interestingly, when respondents are questioned about the suggestion of improving the IRS majority of them, 32.9% have no comments, 23.8% want to improve IRS-related information, and 14.6% of participants are said to announce before the IRS program, while 9.2% of respondents suggest spreading it regularly.

DISCUSSION:

Kala-azar or black fever is endemic for many decades in Bangladesh and its causes a major public health problem. Recently its prevention and control are priorities here. But various control programs primarily rely on controlling the diagnosis and treatment of the disease have often been overlooked despite its importance for the target residents (Ruebush *et al.*, 1992). In this study, we analyze people's healthcare-seeking behavior in the kala-azar pandemic area in Bangladesh to determine the present status of knowledge and attitude toward it to identify the gap from the standard level. In most cases of traditional Bangladeshi social context, the male member of the family plays an important role in controlling the diseases. Therefore, for obtaining household and community participation and making the disease control programs successful it is important to understand local customs and traditions. Understanding the stage of consciousness and its related attitude and practices about Kala-azar in the community can be the key to the success of an elimination program launched by the government of Bangladesh. However, the findings and recommendations of this study will be helpful for improving IRS programs, practitioners, and general people to understand and monitor healthcare programs in the future. It was a household-based cross-sectional survey study about knowledge, attitude, and practice of kala-azar diseases that was administered to the heads of the family through a semi-structured questionnaire. The data indicated that 44.6% of participants are not educated and came from low-income families but had no knowledge about the IRS program although heard about IRS. However, it is interesting that among the participants 99% of respondents heard about Kala-azar. Similar result has been found in a study on Kala-azar disease and preventive attitude (Siddiqui *et al.*, 2010). It is also found that there are poor living conditions in the study village. This condition is an important reason for the increased burning of kala-azar in Bangla-

UniversePG | www.universepg.com

desh. Similar observations were made by Alvar *et al.* (2006) in his article Leishmaniasis and Poverty. KAP (knowledge, attitude, and practice) studies on malaria revealed that the educational status of the study participant is significantly associated with the knowledge and practice of the disease (Panda *et al.*, 2000; Sharma *et al.*, 2003; Sharma *et al.*, 2001). This study showed that the sources of information were mostly from the IRS team family members, and neighbors. It is also found that the role of mass media was limited. This finding is not consistent with the findings of other studies conducted on malaria and dengue (Karanja *et al.*, 2002; Acharya *et al.*, 2005). This result indicates that mass media, such as television, radio, magazines, and newspapers, are not very important transporter for sources of information about kala-azar in Bangladesh. However, interestingly it is found that the highest number of respondents (around 83%) had knowledge about the benefit of the IRS and around 17% had no knowledge about the benefit of the IRS. A similar result has been published in a work studied by Chowdhury (Ahluwalia *et al.*, 2003). The present study findings suggest that the IRS program is not sufficiently implemented for the control of kala-azar and awareness about the IRS program was poor in this area. Despite such poor levels of knowledge about the diseases, interestingly, a good proportion of the respondents pointed out that Kala-azar were not a contagious disease. There are several explanations for it, but one possible explanation is that most people are experienced with kala-azar in this area. Also, it is indicated by most of the participants that at least one member of each family had suffered from kala-azar. Other possible explanations are the limited number of media from which they obtain their information, health care delivery services, absence of health care education, NGOs (non-government organizations) involvement, etc. In this study, we found a wide gap between awareness and related attitude and almost all of the respondents assume that kala-azar is a serious health condition that drains family resources but could be controlled by community effort. Similar results have been revealed in some studies (Matta *et al.*, 2004; Abir *et al.*, 2021; Tyagi *et al.*, 2005; Rijal *et al.*, 2006). These study findings suggest that respondents have a strong positive attitude towards kala-azar and its seriousness. This attitude could come from their experi-

ences in endemic areas. Economically the whole family is affected when a person in the family goes through kala-azar, reinforcing the link between kala-azar and poverty (Masayo et al., 2011). This thing may be one of the important reasons for such a strong attitude towards the effect on their family income. This strong positive attitude of respondents toward Kala-Azar may provide hope for health planners and policy-makers that proper health awareness programs for Kala-Azar will help in controlling the disease at the community level. Besides more implementation of the IRS program is urgently needed to achieve national and regional visceral leishmaniosis elimination goals.

CONCLUSION:

The study findings showed that participants are aware of kala-azar, but their awareness of disease transmission, infection origin, and disease control is still limited. People's attitudes towards complete cure, treatability, and disease control through IRS programs were moderate. Most people know about diseases, but preventive behavior has not been favorable. Therefore, our investigation suggests that continuous support is essential to strengthening behavioral change through the implementation of the IRS program to progress the disease's condition in the pandemic areas in Bangladesh.

ACKNOWLEDGEMENT:

I would like to thank Mr. GM Salauddin (Independent University, Bangladesh) and Dr. Md. Monirul Islam (BioIcon Academy) for their constrictive suggestions to prepare this manuscript.

CONFLICTS OF INTEREST:

Authors have no conflict of interest.

REFERENCES:

- 1) Abir, T., Ekwudu, O., Kalimullah, N. A., (2021). Dengue in Dhaka, Bangladesh: Hospital-based cross-sectional KAP assessment at Dhaka North and Dhaka South City Corporation area. *PLoS ONE*, **16**(3). <https://doi.org/10.1371/journal.pone.0249135>
- 2) Acharya, A., Goswami, K., Srinath, S., & Goswami, A., (2005). Awareness about dengue syndrome and related preventive practices amongst residents of an urban resettlement colony of south Delhi. *J. of Vector Borne Dis.*, **42**(3), 122–127.
- 3) Ahluwalia, I. B., Bern, C., Costa, C., (2003). *Visceral leishmaniasis: Consequences of a neglected disease in a Bangladeshi community. American J. of Tropical Medicine and Hygiene*, **69**(6), 624–628. <https://doi.org/10.4269/ajtmh.2003.69.624>
- 4) Alvar, J., Yactayo, S., & Bern, C. (2006). Leishmaniasis & poverty. *Trends in Parasitology*, **22**(12), 552–557. <https://doi.org/10.1016/j.pt.2006.09.004>
- 5) Chowdhury, R., Huda, M. M., Kumar, V., (2011). The Indian and Nepalese programmes of indoor residual spraying for the elimination of *visceral leishmaniasis*: Performance and effectiveness. *Annals of Tropical Medicine and Parasitology*, **105**(1), 31–45. <https://doi.org/10.1179/136485911X12899838683124>
- 6) Desjeux, P. (2004). Leishmaniasis: Current situation and new perspectives. *Comparative Immunology, Microbiology & Infectious Diseases*, **27**(5), 305–318. <https://doi.org/10.1016/j.cimid.2004.03.004>
- 7) DGHS Health Bulletin, (2008). Directorate General of Health Services. Government of the People's Republic of Bangladesh. https://old.dghs.gov.bd/licts_file/images/Health_Bulletin/HealthBulletin2008.pdf
- 8) DGHS Health Bulletin, (2012). https://old.dghs.gov.bd/bn/licts_file/images/Health_Bulletin/HealthBulletin2012_en.php
- 9) Habib, Z., Ahmed, I., & Jhora, S. (2014). Clinical Burden of Kala-azar in Bangladesh: A Review Update. *Journal of Science Foundation*, **10**(2), 70–79. <https://doi.org/10.3329/jsf.v10i2.17960>
- 10) Islam MS, Dayem SB, and Amin M. (2021). Impact of host genetic players on Covid-19 disease severity: a review of current knowledge and future prospect, Bangladesh. *Eur. J. Med. Health Sci.*, **3**(4), 79-87. <https://doi.org/10.34104/ejms.021.079087>
- 11) Karanja, J., Wambari, E., Okumu, D., (2002). A study of awareness of malaria among Kibera population; implication fo community based intervention. *Journal of National Institute of Public Health*, **51**(1), 51–55.
- 12) Masayo O, Shamim I, Kazi Mizanur R, (2011). Economic Consequences of Post-Kala-azar Der-

- mal Leishmaniasis in a Rural Bangladeshi Community. *Am J Trop Med Hyg*, **85**(3), 528-534. <https://doi:10.4269/ajtmh.2011.10-0683>
- 13) Matta, S., Khokhar, A., & Sachdev, T. R., (2004). Assessment of knowledge about malaria among patients reported with fever: A hospital-based study. *J. of Vector Borne Dis.*, **41**(1-2), 27-31
- 14) Mondal, D., Alam, M. S., Karim, Z., (2008). Present situation of vector-control management in Bangladesh: A wake up call. *Health Policy*, **87**(3), 369 – 376. <https://doi.org/10.1016/j.healthpol.2008.01.011>
- 15) Panda, R., Kanhekar, L. J., & Jain, D. C., (2000). Knowledge, Attitude and Practice towards Malaria in Rural Tribal Communities of South Bastar District of Madhya Pradesh. *Journal of Communicable Diseases*, **32**(3), 222–227. <https://doi.org/10.24321/0019.5138.202146>
- 16) Rijal, S., Koirala, S., Van der Stuyft, P., & Boelaert, M. (2006). The economic burden of visceral leishmaniasis for households in Nepal. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **100**(9), 838–841. <https://doi.org/10.1016/j.trstmh.2005.09.017>
- 17) Ruebush, T. K., Weller, S. C., & Klein, R. E. (1992). Knowledge and beliefs about malaria on the Pacific coastal plain of Guatemala. *American Journal of Tropical Medicine and Hygiene*, **46**(4), 451–459. <https://doi.org/10.4269/ajtmh.1992.46.451>
- 18) Sharma, A. K., Aggarwal, O. P., Chaturvedi, S., & Bhasin, S. K. (2003). Is education a determinant of knowledge about malaria among Indian tribal population? *Journal of Communicable Diseases*, **35**(2), 109–117.
- 19) Sharma, S. K., Pradhan, P., & Padhi, D. M. (2001). Socio-economic factors associated with malaria in a tribal area of Orissa, India. *Indian Journal of Public Health*, **45**(3), 93–98.
- 20) Siddiqui, N. A., Kumar, N., Ranjan, A., (2010). Awareness about kala-azar disease and related preventive attitudes and practices in a highly endemic rural area of India. *Southeast Asian J. of Tropical Medicine & Public Health*, **41**(1), 1–12. <https://doi.org/10.4269/ajtmh.20-0720>
- 21) Singh, S. P., Hirve, S., Huda, M. M., (2011). Options for active case detection of visceral leishmaniasis in endemic districts of India, Nepal and Bangladesh, comparing yield, feasibility and costs. *PLoS Neglected Tropical Diseases*, **5**(2), 960. <https://doi.org/10.1371/journal.pntd.0000960>
- 22) Stauch, A., Sarkar, R. R., Picado, A., (2011). Visceral leishmaniasis in the Indian subcontinent: Modelling epidemiology and control. *PLoS Neglected Tropical Diseases*, **5**(11), e1405. <https://doi.org/10.1371/journal.pntd.0001405>
- 23) Tyagi, P., Roy, A., & Malhotra, M. S. (2005). Knowledge, awareness and practices towards malaria in communities of rural, semi-rural and bordering areas of east Delhi (India). *Journal of Vector Borne Diseases*, **42**(1), 30–35.

Citation: Azam HMS, Sharmin F, and Zohra FT. (2022). Knowledge and attitude of the community people on indoor residual spraying (IRS) program at Kala-azar endemic area in Bangladesh. *Eur. J. Med. Health Sci.*, **4**(4), 122-129. <https://doi.org/10.34104/ejmhs.022.01220129> 