ORIGINAL ARTICLE

Impact of Interventions on Knowledge, Attitude, and Practices related to Bio-Medical Waste Management for Covid – 19 in Non-Health Care settings – A Community Based online study in India

Kashvi Sahjwani[1], Jaanashee Punjabi[2], Raghav Agarwal[3], Sumi Nandwani[4]

Student, LVIS, Noida, Uttar Pradesh, India,

Student, Shriram Millennium School, Noida, Uttar Pradesh, India.

Student, Woodstock School, Mussoorie, India.

Department of Microbiology, SSPHPGTI, Noida, Uttar Pradesh, India

Corresponding Author:

Dr Sumi Nandwani (Corresponding Author)

M.D. (Microbiology) D.N.B. (Microbiology), PGCHM (Hospital management).

Professor and Head, Dept. of Microbiology, PGICH, Noida India- 201303.

Ph No. +91-9818044220(mobile)

e- mail: suminandwani@gmail.com, sumisahjwani@yahoo.com

ABSTRACT

PURPOSE:

To assess the impact of Interventions on Knowledge, Attitude and Practices related to Bio-Medical Waste Management for Covid – 19 in Non-Health Care settings in community in India.

METHOD:

A cross -sectional study over a period of ten months i.e., Nov 2020 to August 2021 was done in various communities in non-hospital setups online in India by a team of students voluntarily who were concerned about the cause during the Covid-19 pandemic. The study group included a total of 200 contacts people in non-healthcare setups like residential complexes, beauty salons, restaurants, shops etc. A questionnaire survey was designed on google form with initial information and consent to participate in the study. This was circulated online to the study group and the responses were graded as satisfactory (more than 50%), and unsatisfactory (less than 50%). Various knowledge and awareness material and trainings for Bio-Medical Waste Management for Covid 19 including a creation of a blog on website 'Apashisht', Audio-visual/ PowerPoint presentations, E- posters and Instagram posts were created. Links to the website and other information and training material were circulated to various responders online on their mail IDs, or their contact details. Online one to one interaction was done to impart knowledge and discuss challenges. Yellow coloured Bio Hazard Labelled Waste Disposal Bags were distributed free of cost to households with Covid positive patients by raising funds and donations to promote segregation of Covid- 19 waste from general waste. A post intervention survey in form of the questionnaire was done after one month and the pre and post training responses were compared and analysed. The results were statistically evaluated using a paired t test with p value < 0.5 as significant.

Results:

A total of 184 people consented to participate in the study and responded to the Questionnaires which were evaluated. Pre training Questionnaire Evaluation revealed a marked lack of knowledge amongst all

categories and all genders of people especially those who were not employed. Major lacunae were noted in areas of Waste Categorisation, Disposal & Segregation. Post Interventions a repeat survey was done to which only 82 responses were received. Interventions had a significant impact with improvement in deficit areas.

Conclusion:

Training and Awareness for all levels of people in non-Health Care Setups is urgently needed and can significantly impact the level of knowledge, attitude and practices for proper Bio -Medical Waste Management in Covid-19 pandemic.

Key words: Impact, interventions, Bio Medical Waste Management, Covid-19, Knowledge, Attitude, Practices, Non-HealthCare Set ups, Online study.

INTRODUCTION

"Bio-medical waste" (BMW) means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals, or in health camps including categories mentioned in Schedule I of Biomedical Waste Management Rules, 2016. (1) Definition of Biomedical waste in COVID-19 context: Biomedical waste in COVID19 context extends to waste generated during treatment, diagnosis, quarantine and home care of COVID19 patients. Solid waste is considered infectious if it is contaminated by body fluids and secretions of COVID-19 patients. (2)

Covid-19 waste is like any other infectious waste and the guidelines for its management, are required to be followed in addition to existing practices under regulation. BMWM in context of COVID-19 is a public health concern and is both a legal and social responsibility for all stakeholders. (3)

As of 13th December 2021, there are 269,468,311 confirmed cases of COVID-19, including 5,304,248 deaths globally with around 34,697,860 confirmed cases of COVID-19 with 475,636 deaths in India (4)

To accommodate the severely ill COVID19 patients, asymptomatic patients were advised for home quarantine. Waste generated during home quarantine period are also potentially infectious and their safe disposal needs to be addressed. This massive quantum of healthcare waste is an unprecedented challenge to the existing infrastructure that needs troubleshooting. PPE is now utilised by general population, patient's attendants visiting hospitals, care centres, office staff in public and private offices, workers in beauty salons airport staffs and railway officials. Many of these users are either unaware or untrained on the potential hazard of improperly discarded protective gears and etiquettes of PPE. (2,5,6)

Central Pollution Control Board (CPCB) of India currently average quantity of COVID-19 related biomedical Waste generation during June, 2021 is about 164 TPD (Tons per day). Peak generation of about 250 TPD was reported on 10/05/2021. The earlier peak generation in the year 2020 was in the range of 180 – 220 TPD. (8,9)

The Ministry of Environment and Forests, India notified the 'Biomedical Waste Management (BMWM) rules' in 1998, which were revised "Bio-Medical Waste Management Rules, 2016" on 28th March 2016 with amendments in 2018 and 2019. (6) CPCB, India has issued specific guidelines for handling, treatment, and disposal of waste generated during treatment, diagnosis, and quarantine of COVID-19 patients on March 18, 2020, followed by a fourth revision on July 17, 2020 [to provide guidance on segregation of general solid waste and BMW & given recommendations on disposal of PPEs from quarantine centers/home-care treating COVID-19 patients]. (5)

Only the used masks, gloves and tissues, or swabs contaminated with blood/body fluids of COVID-19 patients, including used syringes, medicines, etc., if any generated should be treated as BMW & should be collected separately in yellow bags in dedicated dust-bins at designated deposition Centers/ picked up from generation sites which should be handed over to authorized waste collectors. General waste should not be stored in yellow bags. (5) Masks and gloves used by persons other than COVID-19 patients should be kept in paper bag for a minimum of 72 hours prior to disposal of the same as general waste after cutting the same to prevent reuse. (5)

WHO has also released guidelines for safe handling and management of COVID-19 waste on March 3, 2020 followed by revisions in April, 2020, June 2020 and July, 2021. (10,11) At the global level, 18 to 64 per cent Health care workers are reported to have unsatisfactory knowledge about Bio-Medical Waste Management (BMWM) disposal for Covid 19. (12,13,14,15)

The management of the BMW for Covid 19 is an ongoing process and cannot be completed by mere training of health care workers but needs training of all stake holders and users including non-health care workers. With this background, the above study was carried out as a part of ongoing training programme intended for increasing the awareness about BMWM for Covid 19 among non- health care workers in community. The study was carried out with the following

Objectives:

1. To determine the level of Knowledge, Attitude and Practices (KAP) regarding BMWM for Covid-19 among non-HCWs in community and identify the areas of deficit.
2. To study the impact of interventions including knowledge distribution and training on KAP related to BMWM for Covid 19 in this population.

MATERIALS AND METHODS

A cross -sectional study over a period of ten months i.e., Nov 2020 to August 2021 was done in various communities in non-hospital setups online in India by a team of students voluntarily who were concerned about the cause during the Covid-19 pandemic. The study group included a total of 200 contacts people in non-healthcare setups like residential complexes, beauty salons, restaurants, shops etc. A self-distributed pre-tested semi-structured questionnaire survey was designed on google form with initial information and consent to participate in the study was circulated online to the study group. Each questionnaire was composed of two sections. Section A related demographic profile which included Age, gender, community where residing, occupation, history of self/ family being Covid positive and prior training and Section B on KAP related to BMWM and use of PPE for Covid-19 among the non-HCWs. Each correct answer was scored one mark. A self-made grading system was prepared to categorize the overall response of the participants. and the correct responses were graded as satisfactory (more than 50%) and unsatisfactory (less than 50%). Various knowledge and awareness material and trainings for Bio-Medical Waste Management for Covid 19 including the creation of a blog on website 'Apashisht', Audiovisual/PowerPoint presentations, E- posters, and Instagram posts were created. Links to the website and other information and training material were circulated to various responders online on their mail one-to-one online interaction or their contact details in batches over 09 months. A post-intervention survey in form of a questionnaire was done after one month and the pre and post-intervention responses were compared and analysed. A null hypothesis assuming that there is no impact of the intervention on KAP about BMWM was statistically tested. The results were statistically evaluated using a paired t-test with a p-value < .50 as significant using a Stats Calculator.

RESULTS

A total of 184 people consented to participate in the study and responded to the Pre-Intervention Questionnaires of which only 82(44.56%) responses were obtained Post Intervention.

Study group belonged to different cities(states) in India including Noida (Uttar Pradesh) Delhi (Delhi), Surat (Ahmedabad), Bangalore (Karnataka) e.t.c. Majority were 30-50 years of age (67.1% Post I, 70% Pre I), and were either in service (47.4% Post I ,35.3% Pre I) or in business (18.4% Post I ,27.7% Pre I) including many students (11.8%Post I ,11.4%PreI) However fewer housewives (7.9% Post I vs 17.4%Pre I) participated in post-intervention survey as compared to Pre I survey.

Most of them (44.4% Post I, 48% Pre-I) worked in offices or were at home (27.8 %Post I, 29.7% Pre-I) with 63.6% having more than 10 years working experience ,14.1 % no work experience,13 % less than 05 years' work experience. There were more number of responders having more than 10 years working experience post-I. (78.9% Post I vs 63.6% Pre I) There were fewer responses Post I from those with no work experience. (9.2 % Post I vs 14.1% Pre-I).

In Pre Int survey Most of them had not been Covid positive, neither had their family members or staff been affected (as shown in Figures1) However, by the time of post I survey most of them or their family member had suffered from Covid 19 (42.1 % Post I vs. 28.8 % Pre-I) or their staff became positives (52.6 % Post I vs 39.1% Pre-I).

As for Personal Protective Equipment (PPE) usage, masks were being used by most of them (97.3% Pre I, 96.3 % Post I) with the majority (58 %Pre-I), using all three types of masks- N95, Surgical & cloth masks), followed by Gloves (11.4%Pre I, 12.3% Post-I), Face shields (9.3% Pre-I, 2.5% Post-I) and Goggles/Eye cover (3.8% Pre-I, 6.2 % Post-I).

Regarding **Knowledge,** Pre-Intervention Survey revealed, that the majority of them had a marked lack of knowledge amongst all categories and all genders of people especially those who were not employed. Major lacunae were noted in areas of Govt guidelines, Waste Segregation, usage of masks and proper disposal.

Only 50% were aware that there are some Govt. guidelines for BMW waste disposal, although most (83.2 %) were aware that separate-colored bags should be there for general & infectious waste but majority (70.7%) were not aware whether the waste from Covid 19 patient should be mixed with other waste or not. Also, many (45.1%) thought that they were not dealing with any infectious waste. While most of them (69.6%) knew what is an N95 mask, but majority (81.5%) were not aware for how long the mask should be used.

Regarding **Attitude** most of them (85.3%) felt that segregation of waste should be the responsibility of those who generate the waste, most of them (88.6%) felt that that some penalty should be levied for improper Covid 19 waste disposal, and most (97.3%) felt that some training or awareness regarding Covid 19 waste disposal should be given to general public but majority (77.2%) had not undergone any training or attended any awareness session about the same.

Regarding Practices

Pre-Intervention Most of them (78.91 %) did not tear or cut their masks before disposal to prevent reuse. Only few of them (18.5%) were disposing the mask in time and only few (29.3%) were disposing Covid-19 and non-Covid-19 waste separately.

The Pre-I and Post I Responses for all in various areas of BMWM were compared (Figure1, Table1)

Interventions had a significant impact (p values .000 to .49) with improvement in the deficit areas (Table1).

DISCUSSION

Majority responses were from cities or nearby areas where the study volunteers resided. All ages and gender responded.

The response of working people was better than that of unemployed people in the pre intervention survey. This may be because majority of the unemployed people may not have been aware of Govt. of India guidelines and did not have any training.

The number of people with experience of themselves or family or staff becoming positive increased in post intervention survey as it which was carried out after the second wave when a large population was affected unlike the preintervention survey done during or after first wave.

In this study, during pre-intervention survey major lacunae were observed in awareness amongst non HCWs in certain areas of Covid- 19 BMWM especially regarding BMW guidelines, segregation, usage of masks and disposal. Lack of any training was one of the major reasons for the deficit. These are similar to that in other studies done for HCWs. 13,15,16

Although overall response regarding the attitude towards BMWM was satisfactory, but the number of housewives responding to the survey markedly decreased in post intervention survey shows the lack of attitude in this group whereas increase in ratio of service class post intervention who responded shows the will to learn and better attitude in this category.

Regarding practices there were deficits in waste segregation and usage and disposal of masks which improved markedly after interventions.

In this study, **Training and Interventions** had a marked and significant impact leading to improvement in areas of deficit. Similar effectiveness of Training has also been reported for HCWs for BMW in similar studies. 15, 16

CONCLUSION

This study reveals that there were lacunae in knowledge, attitude and practices regarding Covid- 19 Bio Medical waste Management amongst people who were non- Health Care Workers in communities. Training in Biomedical waste management has a significant role to improvise the same and should done as a continual and regular process followed by periodic evaluation to be effective. The Government and society should support and encourage such training programmes even in non-healthcare communities besides the health care facilities to tackle the problem of Improper Covid-19 waste Management as a whole.

REFERENCES

1. MOEF & FF: BMWM Rules. Gazette of India, extraordinary, Part II. Section 2016; 3(i):1–37. Published on March 28,2016. Available at: https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/Bio-medical_Waste_Management_Rules_2016.pdf. (Last Accessed December 10, 2021)
2. MOEF &CC: Solid Waste Management Rules 2016. The Gazette of India: Extraordinary. Part II, 3(ii. 2016. p. 8–12. Published on April 8, 2016. Available at: https://cpcb.nic.in/uploads/MSW/SWM_2016.pdf (Last Accessed December 10, 2021).
3. Current perspectives of biomedical waste management in context of COVID-19. Capoor, M. R., & Parida, A.

Indian Journal of Medical Microbiology 39 (2021) 171–178. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7985622/ (Last Accessed December 10, 2021)) .

4. WHO. Coronavirus disease (COVID-19) Dashboard. Available at: https://covid19.who.int/region/searo/country/in (Last Accessed December 14, 2021).
5. MOEF& FF: Central Pollution Control Board. (Revision 4) Guidelines for Handling, Treatment and Disposal of Waste Generated during Treatment/Diagnosis/Quarantine of COVID-19 Patients. Published on July 17, 2020. Available at: https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/BMW-GUIDELINES-COVID_1.pdf (Last Accessed December 14, 2021)
6. NGT National Green Tribunal. Order regarding COVID-19 waste management dated 24/04/2020. Published on Available at: https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/NGT_Order_covid_28.04.2020.pdf (Last Accessed December 14, 2021)
7. Compliance Status Report by CPCB in OA 72 of 2020 (In Re Scientific Disposal of Bio-Medical Waste Arising Out of COVID-19 Treatment- Compliance of BMW Rules. 2016. Published on July 18, 2020. Available at, https://greentribunal.gov.in/sites/default/files/news_updates/Complaince/statusreport%20.pdf (Last Accessed December 14, 2021)
8. Covid 19 BMWM Status, Central Pollution Control Board, India, Available at https://cpcb.nic.in/uploads/Projects/BioMedicalWaste/COVID19_Waste_Management_status_Jan_May_2021.pdf (Last Accessed December 14, 2021)
9. Covid 19 BMWM Status, central Pollution Control Board, India, Available at https://cpcb.nic.in/uploads/Projects/BioMedicalWaste/COVID19_Waste_Management_status_June_2021.pdf (Last Accessed December 14, 2021)
10. WHO. Infection Prevention and Control during Health Care when Coronavirus Disease (COVID-19) Is Suspected or Confirmed. 2020 (June):1–13. Published on June 29, 2020). Available at https://www.who.int/publications/i/item/WHO-2019-nCoV-IPC-2020.4 (Last Accessed December 10, 2021)
11. WHO. Water, sanitation, hygiene, and waste management (WASH) for the COVID-19 virus: interim guidance. Published on July, 2021 Available at https://www.who.int/publications/i/item/WHO-2019-nCoV-IPC-2021.1 (Last Accessed December 10, 2021)
12. Jalal, S.M.; Akhter, F. Abdelhafez, A.I.; Alrajeh, A.M.Assessment of Knowledge, Practice and Attitude about Biomedical Waste Management among Healthcare Professionals during COVID-19 Crises in Al-Ahsa. Healthcare 2021, 9,747. Available at https://doi.org/10.3390/healthcare 9060747 (Last Accessed December 10, 2021)
13. Kumar J, Katto M, Siddiqui A, et al. (April 20, 2020) Knowledge, Attitude, and Practices of Healthcare Workers Regarding the Use of Face Mask to Limit the Spread of the New Coronavirus Disease (COVID19). Cureus 12(4): e7737. DOI 10.7759/cureus.7737 Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7241223/pdf/cureus-0012-00000007737.pdf (Last Accessed December 10, 2021)
14. Md. Sariful Haque, Kamran Fazal, Prem Kumar Singh, Ahmad Nadeem Aslami, & Rakesh Kumar. (2021). An Assessment of Knowledge, Attitude and Practices (KAP) of Bio-Medical Waste Management During Covid-19 Among Health Care Workers in A Tertiary Care Hospital of Bihar. International Journal of Health and Clinical Research, 4(9), 158–161. Available at: https://ijhcr.com/index.php/ijhcr/article/view/1524(Last Accessed December 14, 2021)
15. Bhagawati, G.; Nandwani, S.; Singhal, S. Awareness and practices regarding bio-medical waste management among health care workers in a tertiary care hospital in Delhi. Indian J. Med. Microbiol. 2015, 33, 580–582.
16. Feldman M, Lacey Krylova V, Farrow P, Donovan L, Zandamela E, Rebelo J, et al. Community health worker knowledge, attitudes and practices towards COVID-19: Learnings from an online cross-sectional survey using a digital health platform, UpSCALE, in Mozambique. PLoS ONE2021 16(2): e0244924. Available at: https://doi.org/10.1371/journal.pone.0244924 (Last Accessed December 14, 2021)

FIGURE1: Comparison of Pre-Intervention and Post Intervention Online Survey on KAP study related to Biomedical Waste in Non-Health Care Setups

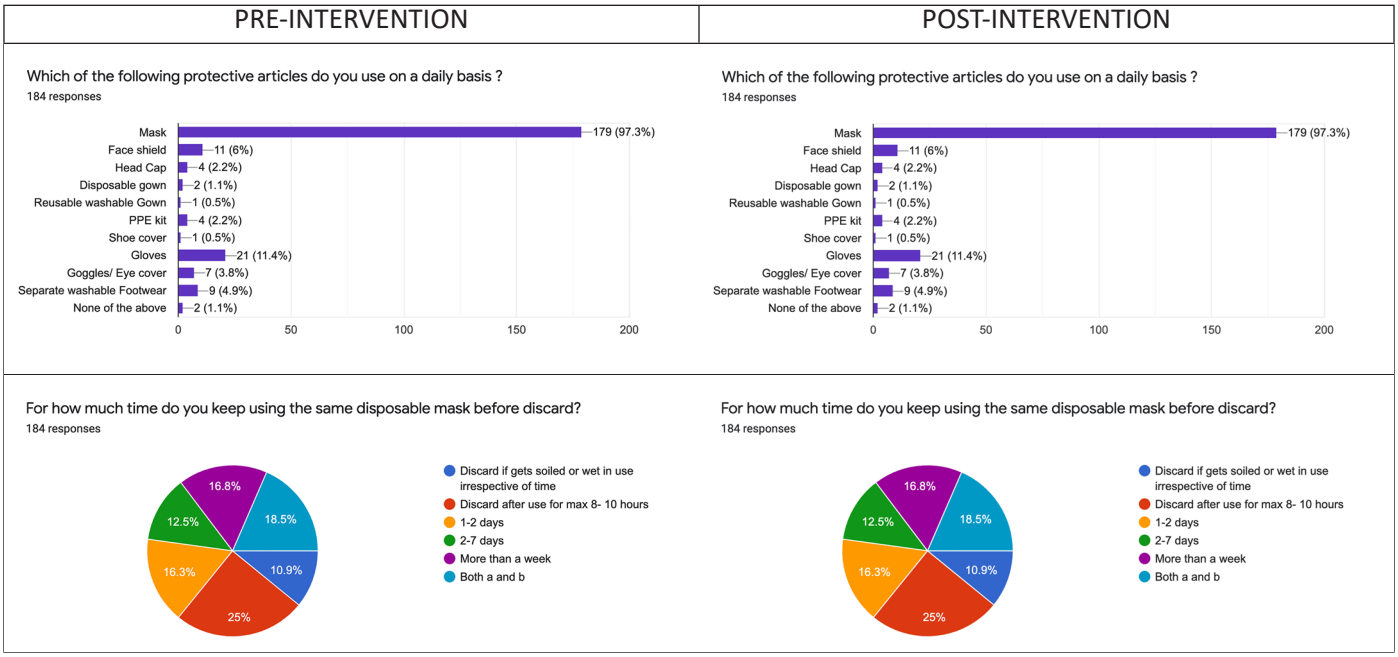

Table No. 1: Comparison of Pre and Post Intervention (% of Correct Responses)

BWM guidelines			**Segregation of BMW**			**N95 mask**			**Training**			**Practise of segregating waste**		
Pre I	Post I	P value	Pre I	Post I	P value	Pre I	Post I	P value	Pre I	Post I	P value	Pre I	Post I	P value
50	69.5	1.40	83.2	95.1	0.54	69.6	78	.380	22.8	29.3	.354	29.3	39	.302
Practice of cutting masks before disposal			Practice of proper usage of Masks			% of Housewives who participated			% of in Service who participated			% of family or self Covid positive		% of staff Covid positive
Pre T	Post T	P value	Pre T	Post T	P value	Pre T	Post T		Pre T	Post T		Pre T	Post T	Pre T	Post T
32.1	39	0.240	18.5	29.3	.045	17.4	9.8		35.3	45.1		28.8	40.2	39.1	50