

COVID-19 related Symptoms and Vaccination Usage among Informal Waste Workers of Kathmandu, Nepal

Khanal A¹

¹ Department of Energy and Environment, TERI School of Advanced Studies, New Delhi, India

ABSTRACT

Corresponding author:

Ashish Khanal
Department of Energy and Environment, TERI School of Advanced Studies, New Delhi, India
Telephone: +9779841075897
Email: ashishkhanalk@yahoo.com
ORCID ID: <https://orcid.org/0000-0003-4175-977X>

Date of submission: 29.04.2022
Date of acceptance: 24.12.2022
Date of publication: 01.04.2023

Conflicts of interest: None
Supporting agencies: None
DOI: <https://doi.org/10.3126/ijosh.v13i2.43929>



Copyright: This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/)

Introduction: About 56% of the total population of Nepal has been fully immunized against COVID-19. But still, migrant workers outside of Nepal are struggling to get COVID vaccines. This study was intended to study the COVID-19 symptoms among IWWs of Kathmandu and the usage of vaccines by them.

Methods: A Cross-sectional study was conducted among 107 IWWs of Kathmandu Valley from Balkhu, Sanepa, Kalimati and Teku areas. A convenience sampling method was used to find the respondents based on their willingness to participate in the study. A face-to-face interview was conducted using a structured questionnaire to collect data from IWWs.

Results: Following the COVID-19 symptoms, most of the waste workers had a fever (89.7%) followed by cough (86%) and respiratory problems (55.1%). Despite of majority of waste workers having COVID-related symptoms, only 19.6% of waste workers had done COVID tests. The majority of IWWs of Kathmandu were afraid to take the COVID vaccine. Around 77.6% of waste workers hadn't still taken the COVID vaccine with a majority (93.9 %) of them identified as Indian nationals.

Conclusion: Despite having COVID-related symptoms, IWWs haven't gone for COVID tests. Though interested, the IWWs need identity cards for vaccination which counts fewer waste workers being vaccinated.

Keywords: COVID-19, Informal waste worker, Kathmandu, Nepal, Solid waste, Vaccine

Introduction

Solid waste management has become a major challenge for different countries of the world. Around 2.01 billion tons of municipal solid waste is generated globally and is predicted to reach 3.40 billion tons by 2050.¹ The amount of solid waste generation in Asia is in an increasing trend which will reach one-third of global waste by 2050.² Nepal is one of the least developed countries located in South Asia which is also having greater challenges with solid waste management due to

population growth.^{3,4}

The rapid urbanization in Kathmandu valley has caused an increase in waste generation with the government facing a difficult situation for effective management of municipal solid waste.^{5,6,7} A study conducted by the Central Bureau of Statistics has recorded 1653 tons of municipal solid waste generation in Nepal.⁸ In 2013, the per capita waste generation of Nepal was 0.3 kg/day which is expected to reach 0.7 kg/day by 2025.^{9,1}

This shows that Nepal is going to have a worst scenario of municipal solid waste in the coming years. Solid waste management is a public issue and can only be managed effectively by the active participation of every stakeholder.¹⁰ A study conducted in 2014 recorded 8047 informal waste workers (IWWs) inside Kathmandu valley.¹¹ However, no study has been conducted recently to identify the exact number of informal workers in Kathmandu City. The informal waste workers are mobile and difficult to have their records due to the lack of governing and monitoring bodies in Nepal. Waste workers face significant occupational health risks due to the nature of their job. The waste workers are even vulnerable, coming in contact with COVID-19-infected people as they move from one place to other for waste collection.

A total of 446,721,132 Coronavirus cases have been recorded with 6,020,572 deaths globally affecting 224 countries and territories as of March 7, 2022.¹² Nepal has recorded 977,501 Coronavirus cases with 11,947 deaths as of March 7, 2022.¹³ The first case of COVID-19 was reported on 13 January 2020 in Nepal in an individual who had returned to Nepal from Wuhan, China.¹⁴ COVID-19 is caused by coronavirus-2 (SARS-CoV-2) leading to severe respiratory problems, hyperinflammatory responses, vascular damage, angiogenesis and widespread thrombosis.¹⁵ The most common symptoms in the initial stage of COVID-19 is upper respiratory tract infection, accompanied by fever, muscle fatigue and pain.¹⁵ COVID-19 has affected everyone whether living in high, middle, or low-income countries with severe health threats.¹⁶ Around half of the respondents had experienced COVID-19-related symptoms during the pandemic with most of the facing fever, cough, aches and muscle pains.¹⁷

It was found that SARS-CoV-2 can survive on plastics and steel for 2-3 days, cardboard for <24 hours and copper for <4 hours.¹⁸ The waste workers have little knowledge about occupational safety and health and adopt fewer safety practices at their workplace.^{19,20} The IWWs deal with recyclables on daily basis increases the risk of contamination by the COVID-19 virus. The improper disposal of hazardous bio-medical

waste (HBMW) causes a risk to public health and the surrounding environment.²¹ The quality and quantity of municipal solid waste (MSW) were also greatly affected.²² There are different types of vaccines available with different storage and distribution systems and possible adverse effects confusing the public.²³ Thus, this study was intended to study the COVID-19 symptoms among IWWs of Kathmandu and the usage of vaccines by them. A total of 56% of the total population of Nepal have been fully immunized against COVID.²⁴ But still migrant workers outside of Nepal are struggling to get COVID vaccines. This study has included two types of IWWs; one working at scrap centers and the other working as Itinerant Waste Buyers (IWBs). The waste segregator at scrap centers have fixed working hours whereas most of the IWBs work independently, purchases the items from houses/institutions, and sells them to scrap center. Whereas the IWBs are commonly called "Feriya" or "Kabadiwala" in Nepal belonging to poor and marginalized social groups.²⁵ Despite the daily engagement of IWWs with solid waste and the high risk of exposure to COVID-19, their vaccine usage has not been assessed properly yet. This needs to be addressed with utmost concern.

Methods

A Cross-sectional study was conducted among IWWs of Kathmandu Valley from Balkhu, Sanepa, Kalimati and Teku areas. Those areas were chosen purposively as the IWWs are more active and easily available in these areas of Kathmandu.²⁵ A pilot survey was conducted among 15 informal waste workers from four different scrap centers in December 2021. 93% of waste workers said that either they are afraid to take the COVID-19 vaccine or are not allowed/asked for it. Based on this, the alternatives for the questionnaire were derived. The sample respondents for this study included 107 waste workers excluding those involved in the pilot survey.

A convenience sampling method was used to find the respondents based on their willingness to participate in the study. As the IWWs are mobile, it's difficult to track their location. However, the IWWs come to the scrap center at least once a day

to sell the recyclables that they have collected. So the study was conducted among those IWBs and scrap center workers who were engaged with the scrap centers in the study sites and were willing to participate in this study. The face-to-face interview was conducted using a structured questionnaire to collect data from IWWs. As the respondents were illiterate, verbal consent was taken and noted in the survey form by the researcher. The data analysis was conducted in the statistical package for social sciences (SPSS) version 20. A descriptive statistics, frequency (n) and percentage (%) were used for report generation. A Pearson’s chi-square test of

association was used to determine the relationship between two categorical variables.

Results

Out of 107 respondents, 53.3% were males and 46.7% were females (Table 1). The respondents were from Nepal (69.2%) and India (30.8%). A question was asked regarding their educational status, where 57% of respondents shared that they haven’t gone to schools or any educational institutions for formal education. However, it doesn’t claim that they mightn’t have been enrolled in any informal education, training, workshops, or seminars.

Table 1. Demographic details of respondents

Variables	Frequency (n= 107)	Percentage (%)
Gender		
Male	57	53.3
Female	50	46.7
Country of Birth		
Nepal	74	69.2
India	33	30.8
Age Group (years)		
18-28	32	29.9
29-39	36	33.6
40-50	28	26.2
51-61	9	8.4
62 and above	2	1.9
Education		
Yes	46	43
No	61	57
Education Level		
Primary	30	65.2
Lower Secondary	11	23.9
Secondary	5	10.9

COVID-19 related symptoms and vaccine usage

Multiple responses from waste workers on having COVID-related symptoms in the last year were recorded (Table 2). It was found that the majority of waste workers had a fever (89.7%) followed by cough (86%) and respiratory problems (55.1%). Despite of majority of waste workers facing COVID-related symptoms, only 19.6% of waste workers had done a COVID test. It shows that 1.9% of waste workers got infected with COVID. The number of waste workers infected with COVID might be less due to the reason that a lesser number of people had gone for COVID test. A majority (77.6%) of waste workers haven’t still

taken the COVID vaccine. From cross-tabulation (Table 3), it was found that 78.9% of male and 76% of female waste workers hadn’t taken the COVID vaccination. Also, 93.9 % of Indian waste workers hadn’t taken COVID vaccine.

A question was asked to find the reason for not having COVID vaccination to date, where 67.5% of waste workers said they are afraid of its consequences whereas, 30.1% said they are either not asked by anyone or not allowed for a vaccine. Apart from this, 50% of Nepalese who were authorized to have vaccination didn't take the vaccine as they were afraid. Also, the youths aged between 18-28 years were among the highest (80%)

number of respondents who were afraid of having COVID vaccine.

Table 2. COVID-related symptoms and vaccination

Variables	Frequency (n= 107)	Percentage (%)
COVID related symptoms		
Fever	96	89.7
Fatigue	48	44.9
Cough	92	86
Respiratory	59	55.1
Loss of smell	14	13.1
COVID test		
Yes	21	19.6
No	84	78.5
Missing	2	1.9
COVID detected		
Yes	2	1.9
No	105	98.1
Vaccination		
Yes	24	22.4
No	83	77.6
Reasons for no vaccination		
Afraid	56	67.5
Not asked	25	30.1
Missing	2	2.4

The p-value (0.7% = 0.007) for the nationality of the people and their vaccination was found to be less than 5% (α value), which means a significant association between nationality and vaccination. It shows that the vaccination of people is dependent on their nationality. Further, a test was conducted to find the strength of the association between the nationality of people and vaccination. The contingency coefficient value was found as 0.254 showing a weak association between the

nationality of waste workers and vaccination. A similar case was with the nationality of waste workers and reasons behind not having the COVID vaccine which shows an association (p-value = 0.033) but was weak (Contingency Coefficient value = 0.245). However, the Pearson Chi-Square test didn't show any association between gender, age group and education of waste workers with COVID vaccination and reasons behind not having the vaccine.

Table 3. Association of different characteristics with COVID vaccination

Characteristics	Vaccinated (n= 107)		p-value	Reasons for no vaccination (n= 83)		p-value
	Yes n(%)	No n(%)		Afraid n(%)	Not asked n(%)	
Gender						
Male	12 (21.1)	45 (78.9)	0.715	29 (66)	15 (34)	0.735
Female	12 (24)	38 (76)		27 (73)	10 (27)	
Nationality						
Nepali	22 (29.7)	52 (70.3)	0.007	37 (72.5)	14 (27.5)	0.033
Indian	2 (6.1)	31 (93.9)		19 (63.3)	11 (36.7)	
Age Group						
18-28	6 (18.6)	26 (81.4)	0.117	20 (80)	5 (20)	0.457
29-39	8 (22.2)	28 (77.8)		13 (52)	12 (48)	
40-50	6 (21.4)	22 (78.6)		17 (74)	6 (26)	
51-61	4 (44.4)	5 (55.6)		5 (100)	0 (0)	

62 and above	0 (0)	2 (100)		2 (100)	0 (0)	
Education						
Yes	8 (17.4)	38 (82.6)	0.278	24 (64.9)	13 (35.1)	0.456
No	16 (26.2)	45 (73.8)		32 (72.7)	12 (27.3)	

Discussion

The study found the majority of the waste workers had symptoms of fever (89.7%), cough (86%) and respiratory problems (55.1%) during the COVID period which is higher than a similar study done among waste workers in Bangladesh which found only 22.2% respondents having fever.¹⁷ In general, the most common symptoms in COVID-19 patients include fever (81.2%), cough (58.5%) and fatigue (38.5%).²⁶ But the difference could be due to the different time frames undertaken for the study. Also, the types of respondents and the nature of their work make one symptom more common than the other.

It was found that the majority of IWWs from India hadn't taken the COVID vaccine compared to IWWs from Nepal. A survey conducted in the United Kingdom found a high level of COVID-19 vaccine hesitancy among ethnic minority groups.²⁷ As a majority of IWBs belong to the "Madhesi" community, this could be the reason for vaccine hesitancy in Kathmandu as well. It is found that there is greater vaccination hesitancy among people with lower education, unemployed people, youths and ethnic groups.²⁸ However this study didn't find any association between gender, age group and education of IWWs with COVID vaccination.

A cross-sectional study conducted among 18,201 people in Bangladesh, India, Pakistan, and Nepal found that vaccine acceptance was statistically similar in both genders in Nepal.²⁹ This is similar to the findings of this study which shows no difference between genders who had taken COVID vaccination.

This study found that there was a significant association between nationality and vaccination in the IWWs of Kathmandu. Before 14th February 2022, people were required to show a Nepali identity certificate (citizenship/passport/voter identity) for COVID vaccination.²⁴ This might have been the main reason the Indian waste

workers were deprived of having COVID vaccine. The people of low-income countries have low levels of education, income, and occupation which may directly affect the vaccine-accepting processes of their people.³⁰ A study conducted in lower-middle-income countries (India, Nepal, Nigeria and Pakistan) found the average vaccine acceptance rate to be 80.3% where concerns about side effects were the most common reason for hesitancy.³¹ This study found that the most common reason for not having the COVID vaccine was that the IWWs were afraid to take a vaccine. The finding was similar to a cross-sectional study conducted in the Benadir region, Somalia which found that the majority (63.2%) of respondents refused to take the COVID-19 vaccine whereas 64.4% believe it wasn't safe.³² The reasons for vaccine hesitancy in the United Kingdom were found to be concern about side effects and lack of trust.²⁷ A study found that mild effects were seen in people in Nepal after having the COVID-19 vaccine and it was acceptable in the sense that the body will need some time to adopt the vaccination dose and gather an immune system to induce protective antibodies.³³

A study conducted in the United States found that 67% of people would accept a COVID-19 vaccine if it is recommended for them.³⁴ A study has found that around 65%, 66%, 72% and 74% of people from Bangladesh, India, Pakistan and Nepal, respectively are willing to be vaccinated against COVID-19.²⁹ As Nepal Government has allowed for COVID vaccine for all (no identity cards) from February 2022²⁴, IWWs should be notified and should be asked for vaccination.

Study Limitations

The study was limited to the core areas of Kathmandu Valley and only included the IWWs. As IWBs were the respondents who mainly belongs to the Terai region of Nepal and neighboring India, the number of people taking the COVID vaccine was less. The Nepal

Government has recently allowed all foreign nationals eligible for COVID vaccine, so the number might be high in the coming days.

Conclusion

The waste workers of Kathmandu seem to be reluctant to have COVID tests and don't want to take vaccines though they are having COVID-related symptoms. The majority of waste workers are afraid of taking a vaccine with Indian nationals not being allowed for vaccination. Though Nepal Government has recently relaxed the requirement of the national identity for the COVID vaccine and the IWWs are not unaware of it. Government should convince the people to implement the vaccine for all campaigns irrespective of boundaries and territories.

Acknowledgments

The author would like to express his gratitude to the participants of the study.

References

1. Kaza S, Yao LC, Bhada-Tata P, Van Woerden F. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. World Bank. 2018. Available from: <https://openknowledge.worldbank.org/handle/10986/30317>
2. Pariatamby A, Tanaka M, Islam A, Rasul G, Manandhar P, et al. Municipal Solid Waste Management in Asia and the Pacific Islands. South Asia Econ J. 2015. Available from: <https://doi.org/10.1007/978-981-4451-73-4>
3. Rai RK, Nepal M, Khadayat MS, Bhardwaj B. Improving municipal solid waste collection services in developing countries: A case of Bharatpur Metropolitan City, Nepal. Sustain. 2019. Available from: <https://doi.org/10.3390/su11113010>
4. Giri S. Integrated solid waste management: A case study of a hotel in Kathmandu, Nepal. Int J Multidiscip Res [Internet]. 2021 May 12;7(5):264–8. Available from: <https://doi.org/10.36713/epra7024>
5. Khanal A. Sustainable Living in Schools: A Study of Vajra Academy, Lalitpur. Curr World Environ [Internet]. 2021 Aug 30 [cited 2021 Dec 17];16(2):472–6. Available from: <https://doi.org/10.12944/CWE.16.2.13>
6. Khanal A, Giri S. Possibility of Community Based Solid Waste Management Project in Chuchepati, Kathmandu. J Basic Appl Eng Res. 2016;3(1):6–8. Available from: <https://doi.org/10.6084/m9.figshare.15164808>
7. Khanal A. Survey on usage of single use plastic bags in Nepal. IOP Conf Ser Earth Environ Sci. 2022;1057:12008. Available from: <https://doi.org/10.1088/1755-1315/1057/1/012008>
8. CBS. Waste Management Baseline Survey of Nepal 2020 [Internet]. Kathmandu; 2021. Available from: <https://cbs.gov.np/wp-content/uploads/2021/04/Waste-Management-Baseline-Survey-of-Nepal-2020.pdf>
9. ADB. Solid Waste Management in Nepal: Current Status and Policy Recommendations [Internet]. Asian Development Bank (ADB). 2013. Available from: <https://www.adb.org/sites/default/files/publication/30366/solid-waste-management-nepal.pdf>
10. Khanal A, Giri S, Mainali P. The Practices of At-Source Segregation of Household Solid Waste by the Youths in Nepal. J Environ Public Health. 2023;2023:1–6. Available from: <https://doi.org/10.1155/2023/5044295>
11. PRISM. PRISM – Poverty Reduction of Informal Workers in Solid Waste Management Sector [Internet]. Kathmandu; 2014. Available from: https://eeas.europa.eu/archives/delegations/nepal/documents/more_info/28.05.014.en_pdf.pdf
12. Worldometer. COVID Live - Coronavirus Statistics [Internet]. 2022 [cited 2022 Mar 7]. Available from: <https://www.worldometers.info/coronavirus/>
13. Worldometer. Nepal COVID - Coronavirus Statistics [Internet]. 2022 [cited 2022 Mar 7]. Available from: <https://www.worldometers.info/coronavirus/country/nepal/>
14. Bastola A, Sah R, Rodriguez-Morales AJ, Lal BK, Jha R, Ojha HC, et al. The first 2019 novel coronavirus case in Nepal. Lancet Infect Dis [Internet]. 2020 Mar 1 [cited 2022 Mar 7];20(3):279–80. Available from: <https://doi.org/10.1016/S1473->

- [3099\(20\)30067-0](https://doi.org/10.1016/j.ejphar.2020.173644)
15. Stasi C, Fallani S, Voller F, Silvestri C. Treatment for COVID-19: An overview. *Eur J Pharmacol*. 2020 Dec 15;889:173644. Available from: <https://doi.org/10.1016/j.ejphar.2020.173644>
 16. Chikaire JU, Ajaero JO, Atoma CN. Socio-economic Effects of Covid-19 Pandemic on Rural Farm Families' Well-Being and Food Systems in Imo State, Nigeria. *J Sustain Environ Manag* [Internet]. 2022 [cited 2022 Mar 7];1(1):18–21. Available from: <https://www.nepjol.info/index.php/josem/article/view/43526>
 17. Haque R, Khan MA, Rahman M, Rahman MS, Begum SA. Mental health status of informal waste workers during the COVID-19 pandemic in Bangladesh. *PLoS One* [Internet]. 2022 Jan 1 [cited 2022 Nov 17];17(1). Available from: <https://pubmed.ncbi.nlm.nih.gov/34995288/>
 18. Jacob S, Nithianandam S, Rastogi S, Sakhuja S, Alankar SNSL. Handling and treatment strategies of biomedical wastes and biosolids contaminated with SARS-CoV-2 in waste environment. *Environ Heal Manag Nov Coronavirus Dis (COVID-19)* [Internet]. 2021 [cited 2022 Feb 5];207. Available from: <https://doi.org/10.1016%2FB978-0-323-85780-2.00012-3>
 19. Khanal A, Sondhi A, Giri S. Use of personal protective equipment among waste workers of Sisdol landfill site of Nepal. *Int J Occup Saf Heal*. 2021;11(3):158–64. Available from: <https://doi.org/10.3126/IJOSH.V11I3.39768>
 20. Asibey MO, Amponsah O, Yeboah V. Solid waste management in informal urban neighbourhoods. Occupational safety and health practices among tricycle operators in Kumasi, Ghana. *Int J Environ Health Res*. 2019; Available from: <https://doi.org/10.1080/09603123.2019.1569211>
 21. Ilyas S, Srivastava RR, Kim H. Disinfection technology and strategies for COVID-19 hospital and bio-medical waste management. *Sci Total Environ* [Internet]. 2020 Dec 20 [cited 2022 Feb 5];749:141652. Available from: <https://doi.org/10.1016/j.scitotenv.2020.141652>
 22. Hantoko D, Li X, Pariatamby A, Yoshikawa K, Horttanainen M, Yan M. Challenges and practices on waste management and disposal during COVID-19 pandemic. *J Environ Manage*. 2021 May 15;286:112140. Available from: <https://doi.org/10.1016/j.jenvman.2021.112140>
 23. Paudel S, Palaian S, Shankar PR, Subedi N. Risk Perception and Hesitancy Toward COVID-19 Vaccination Among Healthcare Workers and Staff at a Medical College in Nepal. *Risk Manag Healthc Policy* [Internet]. 2021 [cited 2022 Feb 5];14:2253. Available from: <https://doi.org/10.2147/rmhp.s310289>
 24. Poudel A. ID card no more needed to get Covid-19 vaccine [Internet]. *The Kathmandu Post*. 2022 [cited 2022 Mar 20]. Available from: <https://kathmandupost.com/health/2022/02/14/id-card-no-more-needed-to-get-covid-19-vaccine>
 25. Khanal A. Livelihood Status of Itinerant Waste Buyers in Kathmandu. *Appl Ecol Environ Sci* [Internet]. 2021 May 17;9(5):537–40. Available from: <https://doi.org/10.12691/aees-9-5-4>
 26. Alimohamadi Y, Sepandi M, Taghdir M, Hosamirudsari H. Determine the most common clinical symptoms in COVID-19 patients: a systematic review and meta-analysis. *J Prev Med Hyg* [Internet]. 2020 Oct 6 [cited 2022 Nov 17];61(3):E304–12. Available from: <https://doi.org/10.15167/2421-4248/JPMH2020.61.3.1530>
 27. Razai MS, Osama T, McKechnie DGJ, Majeed A. Covid-19 vaccine hesitancy among ethnic minority groups. *BMJ* [Internet]. 2021 Feb 26 [cited 2022 Feb 5];372. Available from: <https://doi.org/10.1136/BMJ.N513>
 28. Finney Rutten LJ, Zhu X, Leppin AL, Ridgeway JL, Swift MD, Griffin JM, et al. Evidence-Based Strategies for Clinical Organizations to Address COVID-19 Vaccine Hesitancy. *Mayo Clin Proc*. 2021 Mar 1;96(3):699–707. Available from: <https://doi.org/10.1016/j.MAYOCP.2020.12.024>
 29. Hawlader MDH, Rahman ML, Nazir A, Ara T, Haque MMA, Saha S, et al. COVID-19 vaccine acceptance in South Asia: a multi-country study. *Int J Infect Dis*. 2022 Jan 1;114:1–10. Available from: <https://doi.org/10.1016/j.ijid.2021.09.056>
 30. Acharya KP, Ghimire TR, Subramanya SH. Access

- to and equitable distribution of COVID-19 vaccine in low-income countries. *npj Vaccines* 2021 6(1):1–3. [Internet]. 2021 Apr 14 [cited 2022 Feb 5];6(1):1–3. Available from: <https://doi.org/10.1038/s41541-021-00323-6>
31. Machingaidze S, Wiysonge CS. Understanding COVID-19 vaccine hesitancy. *Nat Med* 2021 27(8):1338–9. Available from: <https://www.nature.com/articles/s41591-021-01459-7>
32. Mohamud AI, Mahamed SA, Jimale KA. Assessments of a COVID-19 vaccine acceptance rate in population of Benadir region, Somalia. *IOSR J Dent Med Sci*. 2021;20(1):1–4. Available from: <http://www.iosrjournals.org/iosr-jdms/papers/Vol20-issue1/Series-5/A2001050104.pdf>
33. Sah R, Shrestha S, Mehta R, Sah SK, Raaban AA, Dharma K, et al. AZD1222 (Covishield) vaccination for COVID-19: Experiences, challenges, and solutions in Nepal. *Travel Med Infect Dis* [Internet]. 2021 Mar 1 [cited 2022 Feb 5];40:101989. Available from: <https://doi.org/10.1016/J.TMAID.2021.101989>
34. Malik AA, McFadden SAM, Elharake J, Omer SB. Determinants of COVID-19 vaccine acceptance in the US. *EClinicalMedicine*. 2020;26:100495. Available from: <https://doi.org/10.1016/J.ECLINM.2020.100495>