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Original

Knowledge and awareness of Algerian healthcare workers about human monkeypox and their attitude toward its vaccination: An online cross-sectional survey

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Objectives: This study was carried out to assess the level of knowledge of Algerian healthcare workers about human monkeypox, and their attitude toward its vaccination.

Methods: An online-based cross-sectional study using social media platforms targeting Algerian healthcare workers was conducted between 28 June and 18 September 2022.

Results: 111 healthcare workers have answered the questionnaire. Overall, a medium level of knowledge (64.9%) was obtained with multiple gaps about the epidemiology and clinical features of this disease. Factors associated with high levels of knowledge included young age, being married and practicing outside the province town. Also, only 38.7% of the respondents were in favor of human monkeypox vaccination if recommended for free with COVID-19 vaccine uptake as a determinant factor of acceptance.

Conclusion: Results have shown a medium level of knowledge and a low rate of vaccination willingness. The findings of this study although not representative of all Algerian healthcare workers, could be a baseline for human monkeypox knowledge and vaccination in Algeria.

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Conocimiento y concienciación de los trabajadores sanitarios de Argelia acerca de la viruela del simio, y actitud de los mismos hacia la vacuna: encuesta transversal online.

RESUMEN

Palabras clave:
Viruela del mono
conocimiento
actitud
vacunas
Argelia

Objetivos: Este estudio se llevó a cabo para evaluar el nivel de conocimiento de los trabajadores de la salud argelinos sobre la viruela del simio humano y su actitud hacia su vacunación.

Métodos: Entre el 28 de junio y el 18 de septiembre de 2022 se llevó a cabo un estudio transversal en línea utilizando plataformas de redes sociales dirigido a trabajadores de la salud argelinos.

Resultados: 111 trabajadores de la salud han respondido al cuestionario. En general se obtuvo un nivel de conocimiento medio (64,9%) con múltiples lagunas sobre la epidemiología y clínica de esta enfermedad. Los factores asociados con altos niveles de conocimiento incluyen la edad joven, estar casado y ejercer fuera de la ciudad de la provincia. Además, solo el 38,7% de los encuestados estaba a favor de la viruela del simio humano si la vacunación se recomendaba de forma gratuita con la aceptación de la vacuna COVID-19 como factor determinante de la aceptación.

Conclusión: Los resultados han mostrado un nivel medio de conocimiento y una baja tasa de disposición a la vacunación. Los hallazgos de este estudio podrían ser una línea de base para el conocimiento y la vacunación contra la viruela del simio humano en Argelia.

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Introduction

After the COVID-19 pandemic and its drastic consequences and sequelae, the world has been facing a new public health threat since May 6th 2022 as a result of the re-emergence of human monkeypox (HMPX) in different non endemic countries.¹ The rapid spread of this disease has engendered a number of 66,551 cases. Prior to this, the WHO had declared the human monkeypox outbreak a public health emergency of international interest since July 2022.^{2,3}

This disease is caused by monkeypox virus; a double-stranded DNA virus, one of the four Orthopoxvirus species pathogenic for humans with variola virus, cowpox virus, and vaccinia virus.^{4,5} The clinical picture of this disease shows suggestive small pox signs with an incubation period of 6 to 13 days (range from 5 to 21 days) and the formation of self-limiting lesions, skin nodules or disseminated rash that could be severe in some individuals, like children, pregnant women or immune-deficient persons. The case fatality rate of this disease varied from 3.6% to 10.6% in the endemic countries.^{1,5} Despite the name of monkeypox, the natural reservoir of this disease is still unknown.³ The virus is mainly transmitted from person to person close contact with lesions, body fluids, respiratory droplets and contaminated materials such as bedding.

Although HMPX has not been notified in Algeria, reported cases in some Arab countries including Bahrain, Egypt, Morocco, Qatar, Lebanon, Saudi Arabia, Sudan and United Arab Emirates³ puts the country at risk of its emergence which necessitates vigilant preparedness and response plans. In this way, healthcare workers (HCWs) are considered as a key group in any preventive measure to limit the spread of this disease.⁶ Thus, prompt assessment of their preparedness and their knowledge and awareness could be of great importance.⁷ This topic has been touched upon in many previous studies around the world.^{7–12}

Considering this context, the current study was conducted to evaluate the level of knowledge of Algerian healthcare workers about HMPX and their attitude toward HMPX vaccines.

Materials and methods

A cross-sectional Web-based survey was carried out in Algeria to evaluate knowledge and awareness of healthcare workers living and practicing in Algeria about human monkeypox and their attitude towards its vaccines, using self-administered questionnaire (SAQ). It was conducted between 28 June and 18 September 2022 by disseminating the Google Forms (Google LLC, Menlo Park, CA, USA, 2021) link on social media platforms in relation with the target population.

Participation in this study was voluntary and no financial incentives or compensations have been given. The participants' identity was kept anonymous to control Hawthorne's effect and information bias.

The SAQ was adopted from previous studies regarding attitude and knowledge about monkey pox in different countries^{10–12} and was administered in Arabic and French languages. It contains 22 multiple-choice items that were stratified into three sections: socio-demographic and professional characteristics (sex, age), knowledge level (using 23 knowledge items with yes/no responses) and attitude toward monkeypox vaccines. To estimate the knowledge level, each item was given a score of one for a correct response and a score of zero for an incorrect response. The scores of the 23 items were added up defining the final score that ranges from 0 to 23, with higher scores indicating better knowledge on HMPX. Finally, the mean level of was calculated (estimated at 14.9) and was used as a point cut-off to dichotomize the knowledge level as high or low as described previously.¹³

Statistical analysis

Data were analyzed using SPSS version 22.0 (SPSS Inc. Chicago, IL, USA, 2011). They were first presented as frequencies (n) and percentages (%) or mean \pm SD for the score knowledge. Chi squared (χ^2) and Fisher tests were used to assess the association between dependent and independent variables.

Subsequently, multinomial logistic regression was used to determine the suggested associated factors with HMPX knowledge an attitude toward HMPX vaccines. All statistical analyses have been performed with a confidence level (CI) of 95% and a significance level (Sig.) of ≤ 0.05 .

Results

Overall, 111 healthcare workers have completed the questionnaire of this study. The general characteristics of the study population are shown in Table 1. The population was dominated by females (70.3%), single individuals (60.4%), and those

living in urban areas (91%) and aged between 18 and 30 years (61.3%).

Regarding their professional status, physicians (40.5%) were the most represented category followed by students (23.4%) and paramedics (22.5%). The majority were practicing in the public sector (88.3%), generally in the province town (59.5%) and most of them were without any practice experience (27.9%) or with a professional experience of 2 to 5 years (25.2%). For their connection to scientific events, 45% of the respondents declared attending province level conference while, 32% and 17% declared that they attended national and international level conference respectively. In terms of their vaccination status, almost half (49.5%) of respondents were vaccinated against COVID-19 while one third (33.3%) only received influenza vaccine.

Human monkeypox knowledge

Results showed that 91.9 % of the respondents were aware of the current monkeypox pandemic while 61.3% had not heard of this disease before 2022.

Table 1 – General characteristics of the study population.

Variable	Number	Frequency
Age	18–30 years old	68
	31–40 years old	28
	Over 40 Years old	15
Sexe	Female	78
	Male	33
Marital Status	Married	44
	Single	67
Residence	Rural	10
	Urban	101
Occupation	Physicians	45
	Pharmacists	8
	Paramedics	25
	Veterinarians	3
	Biologiste	2
	Lab staff	2
	Students	26
Professional experience	Without	31
	Less than 2 years	18
	2–5 years	28
	6–10 years	15
Sector	More than 10 years	19
	Private	13
	Public	98
Working place	Province	66
	Daïra	25
	Municipality	20
Attended regional conferences	Yes	50
	No	61
Attended national conferences	Yes	36
	No	75
Attended international conferences	Yes	19
	No	92
Influenza vaccine uptake	Yes	37
	No	74
COVID-19 vaccine uptake	Yes	55
	No	56

Also, 46.7% of the respondents considered that this topic was normally treated by media, while 24.8% considered that it was overly publicized and the remaining portion (29.4%) saw the disease to be under-mediated. Consequently, 40% of the respondents declared being worried about the evolution of this disease while 36.2% said the opposite and 23.8% of them were indifferent.

Results showed that the mean level of knowledge was estimated at 64.9%. Furthermore, more than half (52.2%) of the knowledge items had a lower rate of correct responses than 70% and about three quarters (73.9%) had a lower rate than 80%. Additionally 34.2% didn't know that there is vaccine (even not widely available) against monkeypox and almost a half (49.1%) knew that small pox vaccines are effective against monkeypox (Supplementary material).

Regarding the knowledge score, the mean score was estimated at 14.9 + 4.5 (of a maximum of 23). This score was used as a cut off for further analysis.

Factors associated with high levels of knowledge

Results of the univariate analysis showed that being a physician/pharmacist was significantly associated with high level of knowledge (Sig.<0.01) while paramedics were associated with the lower rates (Sig.<0.01). Additionally married individuals (Sig.=0.03) and those who attended regional (Sig.=0.03), national (Sig.=0.026) and international conferences (Sig.<0.01) had the highest level than their counterparts.

Results of the logistic regression showed however that, only younger individuals, married and those practicing out of the province were associated with the highest OR of high levels of knowledge (Table 2).

Vaccination intention

Results showed that 38.7% among the asked healthcare workers were willing to be vaccinated if recommended in the near future. Factors associated with being in favour of vaccination included exclusively those who received COVID-19 vaccine (Sig.<0.01). This result was confirmed using multinomial logistic regression (OR= 5.484, Sig. =0.001) (Table 3).

Discussion

The current study was conducted to evaluate the level of knowledge of Algerian healthcare workers about HMPX and their attitude toward its vaccination. To the best of our knowledge this is the first study reporting HMPX knowledge among healthcare workers in Algeria so far.

In fact, healthcare workers are a key group in combating health threats and especially following the emergence of new infectious agents.⁷ Thus, describing their level of knowledge and awareness especially in the initial steps is very helpful to

Table 2 – Factors associated with high level of knowledge about HMPX.

Variables	High (%)	Low (%)	Sig.	OR (CI 95 %)	Sig.	
Age	18–30 years old	40 (58.8)	28 (41.2)	0.244	183.404 (4.81–6993.117)	0.005
	31–40 years old	21(75)	7 (25)	0.13	30.005 (1.819–494.833)	0.017
	Over 40 years old	9 (60)	6 (40)	0.781*	.	.
Sexe	Female	49 (62)	29 (38)	0.935	0.945 (0.285–3.129)	0.926
	Male	21 (63)	12 (37)	.	.	.
Marital Status	Married	33 (75)	11 (25)	0.0347	5.136 (1.19–22.162)	0.028
	Single	37 (55.2)	30 (44.8)	.	.	.
Residence	Rural	5 (50)	5 (50)	0.494*	0.353 (0.058–2.137)	0.257
	Urban	65 (64.4)	36 (35.8)	.	.	.
Occupation	Physician/pharmacist	43 (81.1)	10 (18.9)	0.0001	0.778 (0.053–11.531)	0.855
	Paramedics	9 (36)	16 (64)	0.002*	0.057 (0.003–1.092)	0.057
	Students	12 (46.2)	14 (55.8)	0.07	0.224 (0.011–4.668)	0.334
	Others	6 (85.7)	1 (14.3)	0.257*	.	.
Professional experience	Less than 2 years	11 (61.1)	7 (38.9)	1*	0.302 (0.047–1.926)	0.205
	2–5 years	19 (67.9)	9 (32.1)	0.543	1.28 (0.224–7.315)	0.781
	6–10 years	11 (73.3)	4 (26.7)	0.566*	2.73 (0.288–25.867)	0.381
	More than 10 years	13 (68.4)	6 (31.2)	0.795*	11.801 (0.531–262.378)	0.119
Sector	Without	16 (51.6)	15 (48.4)	0.12	.	.
	Private	12 (92.3)	1 (7.7)	0.029*	10.035 (0.379–265.897)	0.168
Working place	Public	58 (59.2)	40 (40.8)	.	.	.
	Out of province	32 (71.1)	13 (28.9)	0.147	3.8 (1.075–13.43)	0.038
Attended regional conferences	Province	38 (57.6)	28 (42.4)	.	.	.
	Yes	37 (54)	13 (46)	0.03	2.31 (0.679–7.856)	0.18
Attended national conferences	No	33 (54.1)	28 (45.9)	.	.	.
	Yes	28 (77.8)	8 (22.2)	0.026	1.253 (0.339–4.628)	0.735
Attended international conferences	No	42 (56)	33 (44)	.	.	.
	Yes	17 (89.5)	2 (10.5)	0.009*	5.232 (0.72–38.029)	0.102
	No	53 (57.6)	39 (42.4)	.	.	.

Data were analyzed using Chi-squared and Fisher (*) tests. Bold character indicates results with a significance difference (Sig.≤0.05).

Table 3 – Factors associated with intention to get HMPX vaccine.

Variables	Yes (%)	No (%)	Sig.	OR (CI 95%)	Sig.	
Age	18–30 years	26 (38.2)	42 (61.8)	0.891	0.864 (0.061–12.225)	0.914
	31–40 years	12 (42.9)	16 (57.1)	0.605	1.522 (0.208–11.12)	0.679
	Over 40 years	5 (33.3)	10 (66.7)	0.779*	.	.
Sexe	Female	27 (34.6)	51 (65.4)	0.170	0.786 (0.262–2.351)	0.666
	Male	16 (48.5)	17 (51.5)	.	.	.
Marital Status	Married	17 (38.6)	27 (61.4)	0.986	1.62 (0.479–5.478)	0.438
	Single	26 (38.8)	41 (61.2)	.	.	.
Residence	Rural	2 (20)	8 (80)	0.311*	0.283 (0.043–1.875)	0.191
	Urban	41 (40.6)	60 (59.4)	.	.	.
Occupation	Physician/Pharmacist	22 (41.5)	31 (58.5)	0.567	1.203 (0.147–9.821)	0.863
	Paramedics	9 (36)	16 (64)	0.819*	1.221 (0.111–13.368)	0.87
	Students	10 (38.5)	16 (61.5)	0.974	0.966 (0.083–11.201)	0.978
	Others	2 (28.6)	5 (71.4)	0.704*	.	.
Professional experience	Less than 2 years	12 (66.7)	6 (33.3)	0.015*	3.017 (0.553–16.455)	0.202
	2–5 years	9 (32.1)	19 (67.9)	0.503*	0.577 (0.112–2.975)	0.511
	6–10 years	5 (33.3)	10 (66.6)	0.779*	0.343 (0.038–3.11)	0.341
	More than 10 years	6 (31.6)	13 (68.4)	0.608*	0.127 (0.009–1.701)	0.119
	Without	11 (35.5)	20 (64.5)	0.661	.	.
Sector	Private	5 (38.5)	8 (61.5)	1*	0.54 (0.102–2.848)	0.468
	Public	38(38.8)	60 (61.2)	.	.	.
Working place	Out of province	18 (40)	27 (60)	0.822	0.802 (0.262–2.459)	0.7
	Province	25 (37.9)	41 (62.1)	.	.	.
Attended regional conferences	Yes	20 (40)	30 (60)	0.805	0.816 (0.254–2.616)	0.732
	No	23 (37.7)	38 (62.3)	.	.	.
Attended national conferences	Yes	17 (47.2)	19 (52.8)	0.204	1.834 (0.539–6.248)	0.332
	No	26 (34.7)	49 (65.3)	.	.	.
Attended international conferences	Yes	9 (47.4)	10 (52.6)	0.444*	1.487 (0.374–5.908)	0.573
	No	34 (37)	58 (63)	.	.	.
Influenza vaccine uptake	Yes	18 (48.6)	19 (52.4)	0.130	1.86 (0.642–5.389)	0.253
	No	25 (33.8)	49 (66.2)	.	.	.
COVID-19 vaccine uptake	Yes	31 (56.4)	24 (43.6)	0.000	5.484 (1.919–15.675)	0.001
	No	12 (21.4)	44 (78.6)	.	.	.
Level of knowledge	High	24 (34.3)	46 (65.7)	0.208	0.46 (0.139–1.527)	0.205
	Low	19 (46.3)	22 (53.7)	.	.	.

Data were analyzed using Chi-squared and Fisher (*) tests. Bold character indicates results with a significance difference (Sig.<0.05).

estimate their preparedness to provide a proper response and sensitize the general population.

Overall, healthcare workers in this study have shown a medium level of knowledge (64.9% of correct responses). These results seemed to be unsatisfactory and the same observation was reported among different healthcare workers groups in different countries.^{7–11,14} Unsurprisingly, the level of knowledge reported in this study was higher when compared to those reported among the general population in Lebanon and in Saudi Arabia.^{14,15} These results make sense if one considers the lack of attention to this disease in non-endemic countries before the current outbreak.^{10,11}

Regarding factors associated with higher levels of knowledge, results showed that younger individuals, married and those practicing out of the province town were associated with the highest score of knowledge. If the explanation of the two last parameters is unclear, the higher level of knowledge among younger individuals could be related to the fact that this category past most of its time in social media platforms and thus increasing their probability to face with subjects related to monkeypox increasing thus their curiosity.

In this study, only 37.8% of the asked healthcare workers were in favour of vaccination if recommended for free. This

observation is not surprising knowing that a vaccine hesitancy is also common among this category.⁹ This rate is so far lower than the reported rates among healthcare workers in Italy (58.6%)⁹ and in Indonesia (96%).¹² Additionally, a rate of 50.6% was reported among the general population in Saudi Arabia.¹⁶ The only factor of HMPX vaccines was COVID-19 vaccinated people. This could be explained that people who accepted COVID-19 vaccination are less subject to conspiracy theories regarding vaccines.

At last, this study is with limitations which could affect the generalizability of the results to all Algerian healthcare workers. In fact, the online based method of this survey could over-represent or under-represent certain categories and thus could affect directly the level of knowledge and the willingness to get the vaccine. This type of surveys over-represents mostly young healthcare workers who pass generally more time in social media platforms than aged ones and underestimate individuals without access to the internet. These selection biases are mainly due to the fact that the survey was conducted using social media platforms and was not supported or published by any official institution or websites. Another limitation of this study is related to the low number of respondents who answered to the questionnaire.

Finally, in the absence of a validated questionnaire to the Algerian context, the questionnaire items were adopted from other languages which could add other biases to this study.

Conclusion

In conclusion this study, despite some limitations related the sample size and the sampling method, has shown some gaps of knowledge about human monkeypox among the studied healthcare workers in Algeria. The level of vaccine acceptance is also very low. Results of this study even they can not be generalized to all healthcare workers, could be used as a blossom for further studies to better understand this topic which could be helpful in the prevention against an eventual emergence of this disease in Algeria.

Human and animal rights

This study protocol was reviewed and approved by the Scientific Committee of the Faculty of natural and Life Sciences, University of Djelfa (Signed by the dean of the Faculty and the President of the Scientific Committee) with the reference number: 25/06/2022.

Informed consent and patient details

All participants provided their informed consent electronically prior to data collection. Participants who declined consent were not allowed to continue the study, and participants could withdraw from the survey at any time based on requirements of the Declaration of Helsinki Ethical principles.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.vacun.2022.11.003>.

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