

Systematic Review on The Efficacy, Effectiveness, Safety, and Immunogenicity of Monkeypox Vaccine

Ramy Mohamed Ghazy¹ ramy_ghazy@alexu.edu.eg 0000-0001-7611-706X

Ehab Elrewany¹ ehabelrewany@alexu.edu.eg 0000-0002-8700-0630

Assem Gebreal² assem.Ahmed1801@alexmed.edu.eg 0000-0002-2155-8500

Rony ElMakhzangy³ ronyibrahim13@hotmail.com 0000-0002-1089-2677

Noha Fadl³ nohaosama@alexu.edu.eg 0000-0001-9807-2720

Eman Hassan Elbanna⁴ eman.elbanna@alexu.edu.eg 0000-0002-0419-5103

Mahmoud M. Tolba⁵ Mahmoud.tolba@alumni2014.guc.edu.eg 0000-0002-6640-3190

Elsayed Mohamed Hammad² hmad41337@gmail.com 0000-0002-7523-2346

Naglaa Youssef⁶ youssef_naglaa@cu.edu.eg 0000-0002-0368-1759

Hazem Abosheaishaa⁷ hazemabosheaishaa@gmail.com 0000-0002-5581-8702

Elsayed Eldeeb Mehana Hamouda⁸ elsayedhamouda@gmail.com 0000-0002-7567-8049

Zeyad Elsayed Eldeeb Mehana² zeyadhamouda@gmail.com 0009-0006-5673-2018

Ahmed Saad AL Zomia⁹ Ahmedszomia@gmail.com 0000-0002-7850-7229

Raad Ahmed A Alnami⁹ Araad7768@gmail.com

Emad Ali Saeed Salma⁹ Emad2009-1@hotmail.com

Abdulaziz Saleh Alqahtani⁹ AbdulazizSalehAQ@gmail.com

Abdulaziz Fayeze Alshehri⁹ abdulazizalshehri086@gmail.com

Mai Hussein^{10,11,12#} mai.mk.hussein@gmail.com 0000-0003-2735-1428

1. High Institute of Public Health, Alexandria University, Egypt
2. Alexandria faculty of medicine, Alexandria university, Egypt
3. Family Health Department, High Institute of Public Health, Alexandria University, Alexandria, Egypt
4. Health Administration and Behavioral Sciences Department, High Institute of Public Health, Alexandria University, Egypt
5. Pharmaceutical Division, Ministry of Health and Population, Faiyum City, Egypt
6. Medical-surgical nursing, Faculty of Nursing, Cairo University, Cairo, Egypt
7. Icahn School of Medicine at Mount Sinai, NY, USA

8. Department of pathology, Faculty of Veterinary Medicine, Alexandria University, Egypt
9. College of Medicine, King Khalid University, KSA
10. Clinical Research Administration, Alexandria Directorate of Health Affairs, Alexandria, Egypt
11. Egyptian Ministry of Health and Population, Cairo, Egypt
12. Master of Medical Science in Clinical Investigation, Harvard Medical School, USA

Running Title: Monkeypox Vaccination: A systematic review

Keywords: Monkeypox; vaccine safety; vaccine immunogenicity; vaccine effectiveness; vaccine efficacy

Corresponding Author: Mai Hussein

mai.mk.hussein@gmail.com ORCID:0000-0003-2735-1428

Alexandria Clinical Research Administration, Health Affairs Directorate, Ministry of Health and Population, Alexandria 21554, Egypt (+201224939670)

Supplementary material

1. Table S1. Database search

Data base	Number of citations
PubMed Medline	781
PubMed Central	460
Scopus	995
WOS	713
Cochrane Library	10
ProQuest	247
European PMC Preprint	72
MedRxiv	32
Google Scholar	980
Total	4290

PubMed Medline (781)

("Monkeypox virus"[MeSH Terms] OR "Monkeypox"[MeSH Terms] OR monkey?pox[All Fields] OR "monkeypox virus"[All Fields] OR "monkeypoxvirus"[All Fields] OR "monkey?pox?virus"[All Fields] OR "Mpox"[All Fields]) AND ("Vaccines"[MeSH Terms] OR "Immunization"[MeSH Terms] OR "vaccin"[All Fields] OR "immuni"[All Fields] OR "inocula"[All Fields]) AND ("Safety"[MeSH Terms] OR "Vaccine Efficacy"[MeSH Terms] OR "Cost-Effectiveness Analysis"[MeSH Terms] OR "immunogenicity, vaccine"[MeSH Terms] OR "adverse effects"[MeSH Subheading] OR "side effect"[All Fields] OR "Antigenicity"[All Fields] OR "Effectiveness"[All Fields] OR immun*[All Fields] OR "effic"[All Fields] OR "safet"[All Fields])

<https://pubmed.ncbi.nlm.nih.gov/?term=%28%22Monkeypox%20virus%22%5BMeSH%20Terms%5D%20OR%20%22Monkeypox%22%5BMeSH%20Terms%5D%20OR%20monkey%3Fpox%5BAll%20Fields%5D%20OR%20%22monkeypox%20virus%2A%22%5BAll%20Fields%5D%20OR%20%22monkeypoxvirus%2A%22%5BAll%20Fields%5D%20OR%20%22monkey%3Fpox%3Fvirus%2A%22%5BAll%20Fields%5D%20OR%20%22Mpox%22%5BAll%20Fields%5D%29%20AND%20%28%22Vaccines%22%5BMeSH%20Terms%5D%20OR%20%22Immunization%22%5BMeSH%20Terms%5D%20OR%20%22vaccin%2A%22%5BAll%20Fields%5D%20OR%20%22immuni%2A%22%5BAll%20Fields%5D%20OR%20%22inocula%2A%22%5BAll%20Fields%5D%29%20AND%20%28%22Safety%22%5BMeSH%20Terms%5D%20OR%20%22Vaccine%20Efficacy%22%5BMeSH%20Terms%5D%20OR%20%22Cost-Effectiveness%20Analysis%22%5BMeSH%20Terms%5D%20OR%20%22immunogenicity%2C%20vaccine%22%5BMeSH%20Terms%5D%20OR%20%22adverse%20effects%22%5BMeSH%20Subheading%5D%20OR%20%22side%20effect%2A%22%5BAll%20Fields%5D%20OR%20%22Antigenicity%22%5BAll%20Fields%5D%20OR%20%22Effectiveness%22%5BAll%20Fields%5D%20OR%20immun%2A%5BAll%20Fields%5D%20OR%20%22effic%2A%22%5BAll%20Fields%5D%20OR%20%22safet%2A%22%5BAll%20Fields%5D%29&sort=date&ac=yes>

PubMed Central (460)

("Monkeypox virus"[MeSH Terms] OR "Monkeypox"[MeSH Terms] OR monkey?pox[All Fields] OR "monkeypox virus"[All Fields] OR "monkeypoxvirus"[All Fields] OR "monkey?pox?virus"[All Fields] OR "Mpox"[All Fields]) AND ("Vaccines"[MeSH Terms] OR "Immunization"[MeSH Terms] OR "vaccin"[All Fields] OR "immuni"[All Fields] OR "inocula"[All Fields]) AND ("Safety"[MeSH Terms] OR "Vaccine Efficacy"[MeSH Terms] OR "Cost-Effectiveness Analysis"[MeSH Terms] OR "immunogenicity, vaccine"[MeSH Terms] OR "adverse effects"[MeSH Subheading] OR "side effect"[All Fields] OR "Antigenicity"[All Fields] OR "Effectiveness"[All Fields] OR immun*[All Fields] OR "effic"[All Fields] OR "safet"[All Fields])

<https://www.ncbi.nlm.nih.gov/pmc/?term=%28%22Monkeypox%20virus%22%5BMeSH%20Terms%5D%20OR%20%22Monkeypox%22%5BMeSH%20Terms%5D%20OR%20monkey%3Fpox%5BAll%20Fields%5D%20OR%20%22monkeypox%20virus%2A%22%5BAll%20Fields%5D%20OR%20%22monkeypoxvirus%2A%22%5BAll%20Fields%5D%20OR%20%22monkey%3Fpox%3Fvirus%2A%22%5BAll%20Fields%5D%20OR%20%22Mpox%22%5BAll%20Fields%5D%29%20AND%20%28%22Vaccines%22%5BMeSH%20Terms%5D%20OR%20%22Immunization%22%5BMeSH%20Terms%5D%20OR%20%22vaccin%2A%22%5BAll%20Fields%5D%20OR%20%22immuni%2A%22%5BAll%20Fields%5D%20OR%20%22inocula%2A%22%5BAll%20Fields%5D%29%20AND%20%28%22Safety%22%5BMeSH%20Terms%5D%20OR%20%22Vaccine%20Efficacy%22%5BMeSH%20Terms%5D%20OR%20%22Cost-Effectiveness%20Analysis%22%5BMeSH%20Terms%5D%20OR%20%22immunogenicity%2C%20vaccine%22%5BMeSH%20Terms%5D%20OR%20%22adverse%20effects%22%5BMeSH%20Subheading%5D%20OR%20%22side%20effect%2A%22%5BAll%20Fields%5D%20OR%20%22Antigenicity%22%5BAll%20Fields%5D%20OR%20%22Effectiveness%22%5BAll%20Fields%5D%20OR%20immun%2A%5BAll%20Fields%5D%20OR%20%22effic%2A%22%5BAll%20Fields%5D%20OR%20%22safet%2A%22%5BAll%20Fields%5D%29>

Scopus (995)

(TITLE-ABS-KEY ("Monkeypox virus" OR "Monkeypox" OR "monkey?pox" OR "monkeypox virus*" OR "monkeypoxvirus*" OR "monkey?pox?virus*" OR "Mpox")) AND (TITLE-ABS-KEY ("Vaccines" OR "Immunization" OR "vaccin*" OR "inocula*")) AND (TITLE-ABS-KEY ("Safety" OR "Vaccine Efficacy" OR "Cost-Effectiveness Analysis" OR "immun*" OR "adverse effects" OR "side effect*" OR "Antigenicity" OR "Effectiveness" OR "effic*"))

<https://www.scopus.com/results/results.uri?sort=plf-f&src=s&sid=49c60c10bb38d4b69d2c3bd1bed88714&sot=a&sdt=a&sl=404&s=%28TITLE-ABS-KEY%28%22Monkeypox+virus%22+OR+%22Monkeypox%22+OR+%22monkey%3fox%22+OR+%22monkeypox+virus%22+OR+%22monkeypoxvirus%22+OR+%22monkey%3fpox%3fvirus%22+OR+%22Mpox%22%29%29+AND+%28TITLE-ABS-KEY%28%22Vaccines%22+OR+%22Immunization%22+OR+%22vaccin%22+OR+%22inocula%22%29%29+AND+%28TITLE-ABS-KEY%28%22Safety%22+OR+%22Vaccine+Efficacy%22+OR+%22Cost-Effectiveness+Analysis%22+OR+%22immun%22+OR+%22adverse+effects%22+OR+%22side+effect%22+OR+%22Antigenicity%22+OR+%22Effectiveness%22+OR+%22effic%22+%29%29&origin=searchadvanced&editSaveSearch=&txGid=a07a78709a81e6f6572accbe0dc22d55>

Web of science (713)

TS=("Monkeypox virus" OR "Monkeypox" OR monkey?pox OR "monkeypox virus*" OR "monkeypoxvirus*" OR "monkey?pox?virus*" OR "Mpox") AND TS=("Vaccines" OR "Immunization" OR "vaccin*" OR "immun*" OR "inocula*") AND TS=("Safety" OR Efficacy OR "Cost-Effectiveness Analysis" OR "immunogenicity" OR "adverse effects" OR "side effect*" OR "Antigenicity" OR "Effectiveness" OR immun* OR "effic*" OR "safet*")

[https://0c10onwc9-1104-y-https-www-webofscience-com.mplbci.ekb.eg/wos/woscc/summary/71cb5e9e-7cb4-4a55-ae10-db865f29107d-8d467dec/relevance/1\(overlay:export/end\)](https://0c10onwc9-1104-y-https-www-webofscience-com.mplbci.ekb.eg/wos/woscc/summary/71cb5e9e-7cb4-4a55-ae10-db865f29107d-8d467dec/relevance/1(overlay:export/end))

Cochrane (10)

"Monkeypox virus" OR "Monkeypox" OR "monkey?pox" OR "monkeypox virus*" OR "monkeypoxvirus*" OR "monkey?pox?virus*" OR "Mpox" in Title Abstract Keyword AND "Vaccines" OR "Immunization" OR "vaccin*" OR "immuni*" OR "inocula*" in Title Abstract Keyword AND "Safety" OR "Vaccine Efficacy" OR "Cost-Effectiveness Analysis" OR "immunogenicity, vaccine" OR "adverse effects" OR "side effect*" OR "Antigenicity" OR "Effectiveness" OR "immunogenicity" OR "effic*" OR "safet*"

Proquest (247)

noft("Monkeypox" OR "monkey?pox" OR "monkeypoxvirus*" OR "monkey?pox?virus*" OR "Mpox") AND noft("Vaccines" OR "Immunization" OR "vaccin*" OR "immuni*" OR "inocula*") AND noft("Safety" OR "Efficacy" OR "Cost-Effectiveness Analysis" OR "immunogenicity" OR "adverse effects" OR "side effect*" OR "Antigenicity" OR "immun*" OR "effec*" OR "safet*")

European PMC Preprint (72)

("Monkeypox" OR "monkey?pox" OR "monkeypoxvirus*" OR "monkey?pox?virus*" OR "Mpox") AND ("Vaccines" OR "Immunization" OR "vaccin*" OR "immuni*" OR "inocula*") AND ("Safety" OR "Efficacy" OR "Cost-Effectiveness Analysis" OR "immunogenicity" OR "adverse effects" OR "side effect*" OR "Antigenicity" OR "Effectiveness" OR "immun*" OR "immunity" OR "effic*" OR "safet*")

MedRxiv Preprint (32)

(Monkeypox OR "Monkey pox") AND (vaccination OR Immunization) AND (Safety OR Effectiveness OR Efficacy OR Immunogenicity) OR "adverse effects" OR "side effect" OR immunity)

Google Scholar (100)

"Monkeypox virus"|"Monkeypox"|"monkey?pox"|"monkey?pox?virus*"|"Mpox"
"Vaccines"|"inocula*"|"vaccin*"|"immuni*" "Safety"|"Efficacy"|"Cost-Effectiveness
Analysis"|"immune*"|"adverse effects"|"side effect*"|"Antigenicity"|"Effec*"

Total 4290

Endnote Duplicates: 1005

Total new: 3285

2. Assessment of the study quality

<https://drive.google.com/drive/folders/1ji4M25ckNTYPitofa3mJVS9xJz324ZJM>