Review Article

Access this article online

Quick Response Code:

Website:
www.jehp.net

DOI:
10.4103/jehp.jehp_1376_22

Evaluation of strategies against vaccine hesitancy in the COVID-19 and Indian context—A systematic review

Mohammed K. Suhail, Arsalan Moinuddin[1]

Abstract:

The world has been severely affected by the COVID-19 pandemic in terms of loss of lives, health, and its socioeconomic consequences; however, the true magnitude and extent of the damage from COVID-19 is still elusive till date. With the advent of many efficacious vaccines, one of the most effective ways to get to grips with the pandemic is mass vaccination. However, due to vaccine hesitancy (VH), it remains a colossal challenge globally thereby causing serious threat to the pandemic response efforts. This review intends to identify evaluated interventions and evidence to support recommendation of specific strategies to address VH from an Indian context. A systematic review was conducted to synthesize relevant literature around the evaluation of strategies to tackle VH for effectiveness or impact in India. Electronic databases were searched using specific keywords and predefined inclusion–exclusion criteria. A total of 133 articles were screened, 15 were assessed for eligibility, and two were included in the final review. There is a paucity of research on evaluation of vaccine hesitancy interventions in India. Evidence is not strong enough to recommend one specific strategy or intervention. Together, a permutation of multicomponent and tailored interventions has been found most effective in repressingVH in India.

Keywords:

Effectiveness of strategies, impact assessment, vaccination hesitance, vaccine delay, vaccine hesitancy India

Introduction

Vaccines are considered a boon to public health by the global scientific community. Since their inception in the late eighteenth century, vaccines have helped reduce the burden of many infectious diseases and saved innumerable lives by reducing both morbidity and mortality leading to overall better health and wellbeing.[1] There is irrefutable evidence that vaccines are a beneficial, proven, and cost-efficient way of improving health outcomes.[2] To achieve and maintain their proven credibility, the basic requisite is that people should be willing to vaccinate whenever its accessible. Converse to that will is the phenomenon of "vaccine hesitancy" (VH), defined by the World Health Organization (WHO) as the delay in accepting or outright refusal of vaccination. Complete doubtless refusal and complete doubtless acceptance form the two ends of the spectrum of responses to vaccines, and VH lies in between these poles.[3] VH is context specific and complex, with significant variation across different vaccines, places, and time.[4] It is greatly influenced by factors such as complacency, convenience, and confidence (3Cs). The WHO further describes it as the one of the top threats to global public health and highlights an urgent need to identify and address the factors influencing it.[5] In times of global health crises such as large outbreaks of infectious diseases and pandemics, safe and effective vaccines can mitigate disasters. COVID-19 presented an unprecedented challenge to public health,

Doctoral Researcher, School of Health and Life Sciences, Teesside University-Middlesbrough, United Kingdom, [1]Vascular Health Researcher, School of Sport and Exercise, University of Gloucestershire -Gloucester, United Kingdom

Address for correspondence:
Dr. Mohammed K. Suhail, Doctoral Researcher, School of Health and Life Sciences, Teesside University-Middlesbrough, United Kingdom.
E-mail: mksuhail@gmail.com

Received: 18-09-2022
Accepted: 27-10-2022
Published: 28-04-2023

How to cite this article: Suhail MK, Moinuddin A. Evaluation of strategies against vaccine hesitancy in the COVID-19 and Indian context—A systematic review. J Edu Health Promot 2023;12:142.

the like of which has not been seen in many decades; new vaccines' development nonetheless has arguably altered its course thus far. However, for any vaccination program to be successful, it must reach and maintain high uptake and low hesitancy levels.

The context and drivers of vaccine hesitancy - India is a diverse country with population of over 1.3 billion, and this diversity noticeably reflects on one's decision to vaccinate. It is indeed a complex process influenced by a plethora of individual, cultural, social, religious, political, and vaccine-specific factors. This complexity is further aggravated by the convolution of these factors in low- and middle-income countries (LMICs) such as India, wherein the task of combating VH also carries the burden of health and socioeconomic inequalities. Commonly reported reasons for VH in India include concerns related to the safety and efficacy of the vaccines, the notion that trials were not transparent, reports of severe adverse effects, and poor understanding of the clinical aspects of the disease.[6] VH was found to be more prevalent in the elderly, folks living in large joint families and belonging to low socioeconomic status, and low literacy groups.[7] Distrust in vaccines has been observed even in parents who have had their children immunized with the early-years shots of universal immunization.[8] Prior research has also reported higher hesitancy among certain other subgroups such as people not associated with the healthcare sector, rural population, people who prefer social media as their primary source of information, and parents of younger children.[9] Additionally, constant media coverage of deaths and reports of the healthcare system failures led to dissatisfaction with the government's response and contributed to the hesitancy for COVID-19 vaccine.[10]

Eskola *et al.*[11] suggested that tackling VH in a community or a country requires the understanding of its scale, context, and root causes and formulation of targeted strategies based on the analysis. Current conventional approaches are targeted at the individual and community level with interventions focusing on knowledge and awareness. However, they seem inadequate in themselves, if not incorporated as a part of multicomponent strategies.[12] Vaccine, context, and community-specific compound strategies need to be developed to accomplish high demand. This should be followed up by impact evaluation and monitoring for recurrence. Most importantly, evaluation of interventions and strategies related to VH is necessary to assess their effectiveness, ensure accountability and improvement.[13] As apparent from the findings of this systematic review, there is a huge gap in evidence to support effectiveness of interventions in a given context. The caveat is that multicomponent interventions or ones with difficult to measure outcomes (such as social, cultural) are rather challenging to evaluate. Collectively, targeted efforts to fight hesitancy within its setting are disparate, and there is dearth of studies exploring different interventions and their impact in India. This study has helped identify a huge gap in literature; while there are numerous studies looking into the existing and novel strategies, very few have actually assessed their effectiveness against VH in LMICs.

Materials and Methods

A systematic literature review was conducted in July 2022 encompassing four databases: PubMed, Web of Science, Scopus, and EMBASE, with results being reported in line with the requirements of the PRISMA guideline for systematic reviews. The search keywords used were: vaccine hesitancy, hesitance, refusal, resistance, strategies, interventions, impact, effectiveness, assessment, and evaluation. Advanced search was conducted with a combination of keywords and Boolean operators such as AND/OR. Initial results were first de-duplicated, then screened, followed by abstracts review and assessment for eligibility, leading to two studies being included in the final review [Figure 1]. Studies which evaluated the impact or effectiveness of intervention/s to reduce vaccine hesitancy in India with full-text available in English language were considered for inclusion. Articles without interventions, reviews, and commentaries were excluded. Data were extracted from the final two studies and reviewed for evidence to support recommendation of specific strategies or interventions to tackle vaccine hesitancy in the Indian context [Table 1].

Results

The interventions that emerged from the systematic review to have shown measurable impact on VH in India are health education, social mobilization, and co-delivery of interventions [Table 1].[14,15] In the first study by Ansari *et al.*,[14] nearly 80% of the hesitant/resistant families (n = 1025) with children for polio immunization agreed to take the vaccine after targeted health education and social mobilization. During a door-to-door polio campaign, teams of health workers identified resistant households, the ones who refused to let vaccine being given to their children. This was followed by visits from medical interns who provided these households with targeted health education including reassurance that polio drops did not have any side effects and did not cause sterility. Most of the resistant families were convinced by the information and allowed administration of polio drops to their children. However, some continued to be hesitant and were revisited few days later by yet another highly motivated and enthusiastic team alongside religious leaders, health personnel, opinion

Table 1: A detailed description of the two selected articles

Authors	Ansari *et al.*[14]	Neel *et al.*[15]
Year	2007	2021
Title	Reducing resistance against polio drops	30 years of polio campaigns in Ethiopia, India, and Nigeria: the impacts of campaign design on vaccine hesitancy and health worker motivation
Study design	Before-after evaluation	Qualitative analysis
Study aim	To impart correct health education regarding polio eradication program and to assess the impact of social mobilization	To assess the impact of campaign design on hesitancy to polio vaccine
Interventions	Health education and social mobilization	Co-delivery of interventions
Quality of evidence	Average	High
Key findings and conclusion	Nearly 80% of the hesitant/resistant families (*n*=1025) of children for polio immunization agreed to take the vaccine after targeted health education and social mobilization.	Data from 110 semi-structured interviews were analyzed to assess the impact of various interventions in reducing hesitancy to polio vaccine. Co-delivery of health interventions through increased health system responsiveness to community needs was reported to have mitigated VH.

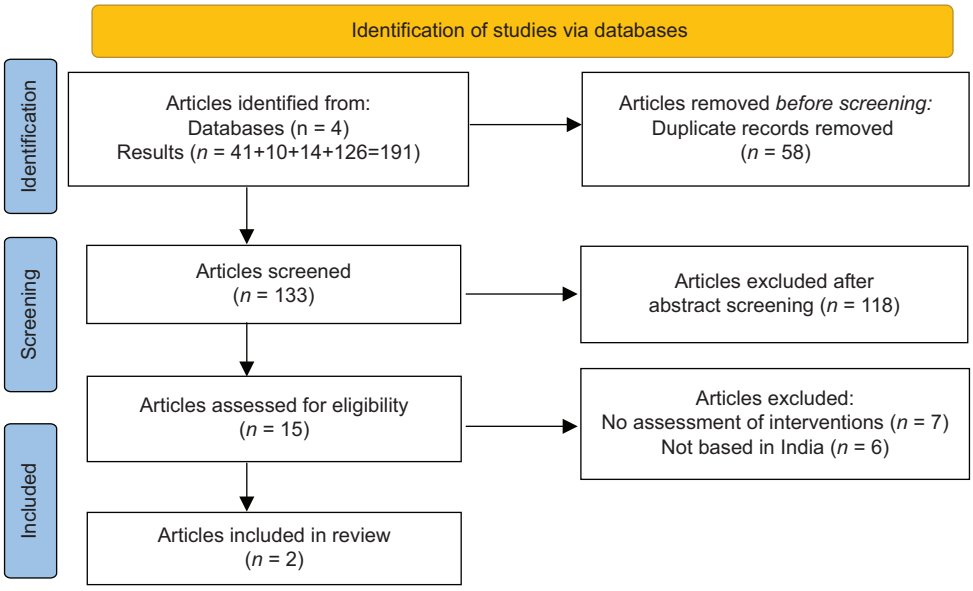

Figure 1: Identification of studies based on PRISMA guideline

makers, and other local influential persons. In the other study by Neel *et al.*,[15] data from semi-structured interviews was analyzed to assess the impact of various interventions in reducing hesitancy to polio vaccine. Co-delivery of interventions ("co-delivery") through "increased health system responsiveness to community needs" was reported to have mitigated VH. India's 107 Block Polio Plan developed in 2009, focused on routine immunization (RI) strengthening, improving sanitation practices and breastfeeding rates, and reducing diarrheal diseases. Following its implementation, the respondents in the study reported a noticeable change in the way vaccination campaigns were received and hesitancy reduced, as co-delivery increased.

The studies discussed above were set against the backdrop of polio campaign in India; other notable mass vaccination campaigns globally include meningococcal A in Africa and meningococcal C in selected high-income countries, etc. They all share some common features: the knowledge and fear pertinent to the disease, publicizing of cases and social norm of vaccination, active involvement of political and religious leaders, community engagement, and easy access to vaccination. Together, these factors have increased vaccine acceptance, albeit their actual impact on hesitancy has not been measured in most cases.[8] In addition, there are lessons to be learnt from the recent events that led to compounding of vaccine hesitancy. During the 2015 Ebola vaccine trials in Ghana, the local media accused researchers of infecting participants with the virus which subsequently led to the suspension and abandonment of the trials.[16] The Vaccine Confidence Project documented the outrage in the Philippines in 2017 after the introduction of a new dengue vaccine, which was reported by its manufacturer Sanofi to have higher risk in individuals never exposed

to dengue before. This had raised major concerns around its perceived importance, safety, effectiveness, and religious compatibility as well.[17] More recently in 2020, an international racism outrage erupted after French researchers suggested the COVID-19 vaccine candidates should be tested in Africa first, during the early stages of the trials. Despite an apology from them later, it nevertheless caused significant damage to the research in the continent and the ensuing acceptance of the vaccine.[18]

Discussion

Concurrent to the aims of this study, multistrategy interventions were identified as most effective against VH. Jarrett *et al*.[12] posited highest increase in vaccine uptake with 1. focus on unvaccinated individuals and specific populations, 2. increasing vaccination knowledge and awareness, 3. convenient and better access, 4. making vaccinations compulsory, and 5. engaging community and religious leaders. Health education initiatives especially the ones integrated with routines activities and processes were found to greatly improve knowledge and attitudes.[14] Higher hesitance is understandably reported in individuals toward newer vaccines as Karlsson *et al*.[19] surmise that the expedited and novel approaches of development of COVID-19 vaccines, in contrast to the conventional ones, may have influenced the perceived risk of vaccination. Thus, the messaging around implementation of vaccines becomes paramount; individuals will believe something to be safer if they also perceive it to be beneficial.[20] Addressing VH necessitates behavior change just like any other complex health and social issue. Humans as social beings have their health and related decisions also socially linked. There is a clustering tendency in vaccine-hesitant individuals which results in an increased transmission of vaccine preventable diseases among these groups. Identification of such clusters will help in better targeting of interventions.[21] A close association has also been reported between adherence to safety measures and hesitancy, with people not adhering to the protocols such as wearing masks and social distancing more likely not intending to get vaccinated, forming a higher risk group that needs to be addressed. For information and communication sharing, exploring targeting of platforms such as TV shows, movies, and other alternative sources such as over-the-top (OTT) services which the vaccine-hesitant individuals trust and are less likely to evade, might yield more dividend.

With health education being identified as a potentially effective intervention[14] from this review, congruently, government health mobile applications should have information and FAQ section in as many regional languages as possible, which are usually limited to some of the major ones only. In the case of COVID-19, up-to-date information on vaccination centers and type of vaccine being offered should be available on these apps and online. Addressing different facets of COVID-19 testing, vaccination, contact tracing, and related information, there are multiple online platforms operated by the government such as Aarogya Setu, CoWin Dashboard, and Ministry of Health and Family Welfare (MoHFW) websites. A unified central platform to encompass them all might be easier to access and more effective in achieving maximum outreach. Currently, the aforementioned platforms do not adequately address the adverse effects of vaccination in their FAQs or general information sections, which if available can greatly increase awareness and confidence of the users. To enhance co-delivery, smaller details such as well-organized vaccination centers, friendly behavior of the staff, aseptic techniques, good IPC practices, and social distancing on sites should not be overlooked.

Some of the frequently cited effective strategies in literature include mass/social media influences, communication strategies, and training of healthcare workers.

Influence of social media - VH has two major influences, social norms and interaction with healthcare providers.[8] The norms are shaped by social media and networks, which are sources of information for people based on which they form opinions and choose to delay or refuse vaccination. Notably, people who oppose vaccination are often the ones over-represented in discussions on social media and public forums, muffling the voices of those in favor. For a significant percentage of people, the sources of information about emerging infectious diseases (most recently monkeypox) and vaccines are largely social media platforms; where the accuracy and reliability of the information is highly inconsistent, and prior research suggests bias toward falsification, propaganda, and conspiracies.[22] There were conspiracy theories galore on social media around COVID-19 vaccine in India such as DNA alteration, presence of nano-chips, and adverse effects such as infertility and miscarriage.[23] Ebrahimi *et al.* highlight the need to address the menace of false information from unmonitored sources, illustrating that even low exposures to inaccurate and negative information increase the level of perceived risk from vaccination.[9]

Some studies have noted specific rumors/myths are more common than others in specific communities, e.g. vaccines causing sterility and presence of pork-derived components.[8,24] Tailored interventions targeting these are bound to be most fruitful, as outlined in the study by Ansari *et al*.[14] As has already been done to various extents in polio and RI campaigns, religious

gatherings, organizations, and local leaders should be utilized as valuable opportunities to reach out to and address concerns of those communities. To surmount resistances linked to religion/faith, in the past slogans such as "Worship the goddess, but to please her, take vaccination"[25] have been used. This is an exemplar of the type of improvisations needed, bearing in mind the cultural sensitivities; medical and scientific approaches alone cannot address certain concerns.

Communication is key - MacDonald argues communication is not a determinant but rather a tool in relation to VH.[3] Poor quality of services including poor communication can lead to poor acceptance. Although vital, mere knowledge is not enough to change one's behavior; who and where the message comes from is central in building trust. A good communication strategy needs to be proactive and incorporated into a vaccination program from the outset. It should be a fine balance of listening and telling and engaging with the intended audience. If employed with careful planning and integration, communication strategies can positively influence population behaviors toward many health issues including VH. For this, public transport points and means can serve as great platforms for vaccine promotion. Throughout the year across the country, there are some ongoing political activities such as campaigning, events, and protests. The national, state, regional, and local political parties could use these events for vaccine promotion. The increase in internet usage and online presence, triggered during the lockdowns, can be used as a leverage for combating vaccine hesitancy, with prolific pro-vaccination and myth-buster messages across various platforms. Similarly, mapping and monitoring of online media contents and sentiments may aid further in shaping the communication strategies.[26] However, there must be a fine balance. A randomized controlled trial on MMR and autism showed vaccine hesitancy could even be reinforced by some communication interventions; too strong advocacy of vaccination may turn out to be counterproductive.[27]

Healthcare and Support Workers - The community health workers known as AWWs (Anganwadi Workers) and the community health volunteers known as ASHAs (Accredited Social Health Activists) form the grassroots units of the Indian public health system. They are an indispensable work force, and when utilized efficiently they have proven to greatly improve outreach in the rural and tribal populations. To enhance their utility in vaccination implementation and co-delivery, the Healthcare workers (HCWs), AWWs, and ASHAs need to be trained with adequate knowledge and communication skills. Another long-term approach to training HCWs is the inclusion of appropriate content around VH and immunization in general, in the curriculum of healthcare education and training[11] including medicine, nursing, pharmacy, and AYUSH. In the same vein, VH in HCWs should be addressed as a priority, as their standpoint greatly affects the community they live in and work with. HCWs are also the most common points of contact to answer questions and concerns.[28]

Engagement of other stakeholders - More than 65% of India's population live in rural areas (Census 2011). AYUSH (Ayurveda, Yoga, Unani, Siddha, and Homeopathy), the indigenous alternative medicine systems popular in India, cater to a large share of the rural health needs. This is often due to the lack of or poor healthcare services from the government and unaffordability of private healthcare. AYUSH practitioners should be taken on-board for an increased outreach within this population; the Alma-Ata Declaration recommends utilizing the contribution of "traditional practitioners" as necessary to meet the health needs.[29] This will also address the issue of alternative medicine practitioners negatively influencing the vaccination decision.[26] However, there is also the debate that doing so will be equivalent to lending legitimacy and validation to many self-claimed AYUSH practitioners who are unqualified and unregulated. UNICEF has played a major role in social mobilization and countering resistance in polio eradication and RI,[30] and this know-how should also be utilized for combating the general VH as well. With its extensive experience in health communication, influencing behavioral change and dealing with civil societies and organizations, UNICEF can continue to be deployed to support the national and state governments in tackling COVID-19 vaccine hesitancy. Literature suggests people who consider COVID-19 as a threatening disease have a higher intention to get vaccinated. Similarly, people who fear someone from their close family or friends may suffer from the serious effects of the infection, less frequently reported hesitation.[19] Highlighting the consequences of remaining unvaccinated and how it affects them, their loved ones and the larger community may also be used as a part of the health education strategy. To sum up, a congruous combination of appropriate measures, mediums, and tools will yield better outcomes in tackling VH. Potential limitations of this review are exclusion of any studies in regional Indian languages and grey literature, and both included studies being based in the context of polio campaign.

Summary and Conclusion

Hesitancy to vaccines and some resistance in general to any large public health campaign, especially the mandated ones, must be anticipated and arguably understandable. This does not imply the outright

rejection of the public health program but only highlights the need for a more encompassing approach.[25] Despite the issues with vaccine confidence, most countries in the world have a high rate of universal immunization which reflects the fact that vaccination continues to be a popular measure. Increasing the demand and acceptance of vaccines requires continuous engagement of the community and trust building. Any drive to introduce new vaccines should be assisted with continued health system responsiveness to community needs as posited by Neel *et al.*,[15] and backed by maintained confidence in the existing vaccination programs. This confidence is derailed by suboptimal communication and low levels of trust among the people that the government will act based on scientific evidence in the best interest of public health and safety.[18] Perceived secrecy around any aspects of the vaccine will have a compounding effect on the problem. Thus, lucid communication is essential to prevent VH and promote confidence. There is a need to go beyond the traditional channels of communication and explore multiple avenues to address VH. Asserting the need of vaccination while acknowledging negative emotions such as fear and anger may assist in confronting the psychological aspects of hesitancy.

The SAGE Working Group on Vaccine Hesitancy issued three categories of recommendations: 1. improving the understanding of VH, its determinants and the associated challenges, 2. improving the structural and organizational capacity required to counter VH and increase acceptance, and 3. sharing lessons learnt globally and development of new tools.[4] The WHO has developed a guide to help countries address hesitancy more effectively, known as Tailoring Immunization Programs (TIP), which provides excellent tools to define and diagnose determinants of VH and propose appropriate interventions.[31] TIP was mainly intended for improving RI but can also be utilized to tackle VH in other contexts and emergencies such as COVID-19. The factors influencing VH do not remain static in a country for a long period of time,[30] and thus, the strategies require regular assessment. Jarrett *et al.*[12] noted that many of the current interventions operate from an "assumption-based" approach rather than an "evidence-based" one. And as substantiated in this review and corroborated by the findings of Sadaf *et al.*,[32] evidence is not compelling enough to argue which strategies or interventions are the most effective against vaccine hesitancy and refusal. Several studies have evaluated interventions for increasing immunization coverage but rarely measured outcomes linked to VH or change in attitudes toward vaccines. There is a dire need for evaluation of the implemented strategies and interventions; rigorous assessment of their impact through well-designed research and sharing the lessons learnt is critical. New research studies are shedding more light on the determinants of vaccine hesitancy, and the findings should continually inform the planning, implementation, evaluation, and refinement of the implemented strategies.

Acknowledgements

The authors are grateful to Dr Dorothy Hannis for her guidance in shaping this study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Greenwood B. The contribution of vaccination to global health: Past, present and future. Philosophical Transaction of the Royal Society B 2014;369. doi: 10.1098/rstb. 2013.0433.
2. WHO. Immunization 2019. Available from: https://www.who.int/news-room/facts-in-pictures/detail/immunization. [Last accessed on 2021 Aug 04].
3. MacDonald NE. Vaccine hesitancy: Definition, scope and determinants. Vaccine 2015;33:4161-4.
4. WHO. Report of the SAGE Working Group on Vaccine Hesitancy 2014. Available from: https://www.who.int/immunization/sage/meetings/2014/october/1_Report_WORKING_GROUP_vaccine_hesitancy_final.pdf. [Last accessed on 2021 Aug 14].
5. WHO. Ten Threats to Global Health in 2019 2019. Available from: https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019. [Last accessed on 2021 Aug 15].
6. Kumar R, Bairwa M, Beniwal K, Kant R. COVID-19 vaccine acceptability, determinants of potential vaccination, and hesitancy in public: A call for effective health communication. J Educ Health Promot 2021;10:392. doi: 10.4103/jehp.jehp_327_21
7. Godasi GR, Donthu RK, Mohammed AS, Pasam RS, Tiruveedhula SL. Attitude towards COVID-19 vaccine among the general public in south India: A cross sectional study. Arch Ment Health 2021;22:28-35. doi: 10.4103/amh.amh_33_21.
8. Dubé E, Gagnon D, MacDonald NE. Strategies intended to address vaccine hesitancy: Review of published reviews. Vaccine 2015;33:4191-203.
9. Ebrahimi OV, Johnson MS, Ebling S, Amundsen OM, Halsøy Ø, Hoffart A, *et al.* Risk, trust, and flawed assumptions: Vaccine hesitancy during the COVID-19 pandemic. Front Public Health 2021;9. doi: 10.3389/fpubh. 2021.700213.
10. Dror AA, Eisenbach N, Taiber S, Morozov NG, Mizrachi M, Zigron A, *et al.* Vaccine hesitancy: The next challenge in the fight against COVID-19. Eur J Epidemiol 2020;35:775-9.
11. Eskola J, Duclos P, Schuster M, MacDonald NE. How to deal with vaccine hesitancy? Vaccine 2015;33:4215-7.
12. Jarrett C, Wilson R, O'Leary M, Eckersberger E, Larson HJ. Strategies for addressing vaccine hesitancy – A systematic review. Vaccine 2015;33:4180-90.
13. Bhana, A. and Govender, A. Evaluating interventions. *In* Promoting Mental Health in Scarce-Resource Contexts. Emerging Evidence and Practice, I. Petersen, A. Petersen, A. Bhana, A.J. Flisher, L. Swartz, and L. Richter (eds). HSRC Press, Cape Town. 2010, pp. 60-81. p
14. Ansari MA, Khan Z, Khan IM. Reducing resistance against polio drops. J R Soc Promot Health 2007;127:276-9.
15. Neel AH, Closser S, Villanueva C, Majumdar P, Gupta SD, Krugman D, *et al.* 30 years of polio campaigns in Ethiopia, India

and Nigeria: The impacts of campaign design on vaccine hesitancy and health worker motivation. BMJ Global Health 2021;6:e006002. doi: 10.1136/bmjgh-2021-006002.

16. Kummervold PE, Schulz WS, Smout E, Fernandez-Luque L, Larson HJ. Controversial Ebola vaccine trials in Ghana: A thematic analysis of critiques and rebuttals in digital news. BMC Public Health 2017;17:642. doi: 10.1186/s12889-017-4618-8.
17. Larson HJ, Hartigan-Go K, de Figueiredo A. Vaccine confidence plummets in the Philippines following dengue vaccine scare: Why it matters to pandemic preparedness. Hum Vaccin Immunothera 2019;15:625-7. doi: 10.1080/21645515.2018.1522468.
18. Bhopal S, Nielsen M. Vaccine hesitancy in low- and middle-income countries: Potential implications for the COVID-19 response. ArchiDisease in Childhood 2021;106:113-4.
19. Karlsson LC, Soveri A, Lewandowsky S, Karlsson L, Karlsson H, Nolvi S, *et al*. Fearing the disease or the vaccine: The case of COVID-19. Pers Individ Dif 2021;172. doi: 10.1016/j.paid. 2020.110590.
20. Wagner AL, Masters NB, Domek GJ, Mathew JL, Sun X, Asturias EJ, *et al.* Comparisons of vaccine hesitancy across five low- and middle-income countries. Vaccines 2019;7. doi: 10.3390/ vaccines7040155.
21. Onnela J-P, Landon BE, Kahn A-L, Ahmed D, Verma H, O'Malley J, *et al.* Polio vaccine hesitancy in the networks and neighborhoods of Malegaon, India. Soc Sci Med 2016;153:99-106.
22. Browne M. Epistemic divides and ontological confusions: The psychology of vaccine scepticism. Hum Vaccin Immunother 2018;14:2540-42.
23. Kanozia R, Arya R. "Fake news", religion, and COVID-19 vaccine hesitancy in India, Pakistan and Bangladesh. Media Asia 2021. doi: 10.1080/01296612.2021.1921963.
24. Agrawal A, Kolhapure S, Pasquale AD, Rai J, Mathur A. Vaccine hesitancy as a challenge or vaccine confidence as an opportunity for childhood immunisation in India. Infect Diseases Therapy 2020;9:421-32.
25. Juran L, Trivedi J, Kolivras KN. Considering the "public" in public health: Popular resistance to the Smallpox Eradication Programme in India. Indian Journal of Medical Ethics 2017;2:104-11.
26. Das MK, Singh D, Sharma S. Media news on vaccines and vaccination: The content profile, sentiment and trend of the online mass media during 2015–2020 in India. Clin Epidemiol Global Health 2021;10. doi: 10.1016/j.cegh. 2020.100691.
27. Nyhan B, Reifler J, Richey S, Freed GL. Effective messages in vaccine promotion: A randomized trial. Pediatrics 2014;133:835-42.
28. Venkatesan K, Menon S, Haroon NN. COVID-19 vaccine hesitancy among medical students: A systematic review. J Educ Health Promot 2022;11:218.
29. Declaration of Alma-Ata International Conference on Primary Health Care, Alma-Ata, USSR, 6–12 September 1978. Development 2004;47:159-61. doi: 10.1057/palgrave.development. 1100047.
30. Lane S, MacDonald N, Marti M, Dumolard L. Vaccine hesitancy around the globe: Analysis of three years of WHO/UNICEF joint reporting form data-2015–2017. Vaccine 2018;36. doi: 10.1016/j. vaccine. 2018.03.063.
31. Butler R, MacDonald NE. Diagnosing the determinants of vaccine hesitancy in specific subgroups: The guide to tailoring immunization programmes (TIP). Vaccine 2015;33:4176-9.
32. Sadaf A, Richards JL, Glanz J, Salmon DA, Omer SB. A systematic review of interventions for reducing parental vaccine refusal and vaccine hesitancy. Vaccine 2013;31:4293-304.