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Posted Date: 31 March 2025

doi: 10.20944/preprints202503.2383.v1

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Review

Attitudes, Perceptions, and Hesitancy Towards a Combined COVID-19 and Influenza Vaccination: A Scoping Review

Karan Varshney [1,2,*], Ivana Skakic [2], Prerana Ghosh [2], Maya Raj [2] and Darshan Shet [3]

[1] School of Population and Preventive Medicine, Monash University, VIC, Australia
[2] School of Medicine, Deakin University, VIC, Australia
[3] Northern Health, VIC, Australia
* Correspondence: karan.varshney@students.jefferson.edu

Abstract: Introduction: COVID-19 and influenza are viruses that have been major causes of morbidity and mortality worldwide. While a combination vaccine for these two viruses is currently in development, little is known about public perceptions and attitudes towards such a vaccine. Therefore, we have aimed to conduct a scoping review to evaluate the attitudes, and reasons for acceptance/rejection of a combination COVID-19 and influenza vaccination. **Material and Methods:** Our review has followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR) guidelines. Search terms included those on COVID-19, influenza, and combination vaccines. Searches were conducted in a total of 10 different databases: Embase, Global Health, Google Scholar, CINAHL, Medline, Scopus, ScienceDirect, PubMed, PsycINFO, and Web of Science. **Results:** Searches across all databases produced a total of 1763 results, of which five were deemed to be eligible for this review. Generally, participants had favourable views towards a combination vaccine. Reasons provided for accepting a combination vaccine include low cost, reasonable effectiveness, fewer injections, and higher safety. However, reasons for rejection of a potential combination vaccine include a potential lack of evidence and lack of studies regarding its effectiveness, and a fear of possible side effects. **Conclusions:** While there are generally positive attitudes and perceptions towards a combination vaccination for COVID-19 and influenza, there is also a sizeable proportion of the population that has shown hesitancy towards such a vaccine. Vaccination delivery programs should clearly demonstrate that these vaccines are safe and must concurrently address false rumours and misinformation.

Keywords: COVID-19; influenza; vaccination; combination; attitudes; acceptability; qualitative

Introduction

Coronavirus disease (COVID-19) and influenza virus are both major causes of morbidity and have been a major cause of death worldwide [1–3]. It has been estimated that global excess mortality attributed to COVID-19 between 2020 and 2021 was 5.94 million deaths [2]. Past estimates for total annual deaths due to influenza have been as high as nearly 400,000 [3]. Furthermore, the risk of severe respiratory illness and deaths in populations was found to be very high where co-infection occurs [4–7]. A prior systematic review demonstrated that mortality rates of patients co-infected with influenza and COVID-19 was 15-25% in some settings [7].

Vaccination for COVID-19 and influenza viruses has been integral to reducing the morbidity and mortality from infection. It has been estimated that as many as 14.4 million lives were saved in a single year due to COVID-19 vaccination [8]. Likewise, numerous studies have demonstrated the importance and success of influenza vaccination in reducing morbidity and mortality for this virus [9–11]. However, to ensure optimal protection from these vaccinations, there is a need to regularly

 doi:10.20944/preprints202503.2383.v1

receive multiple doses [12,13]. To address the need for routine vaccination for both viruses, calls have been made for the development of a combination vaccination containing COVID-19 and influenza.

Combination vaccines protect against two or more diseases, or against two or more strains of the same disease. A combined vaccine includes two or more antigens either combined by the manufacturer or mixed immediately before administration as a single product, in comparison to two or more vaccines being administered through multiple injections on the same day [14]. Combination vaccines came into use in the mid-1950s with the administration of individual diphtheria, tetanus, and pertussis (DTP) vaccines as a single, combined product. Further combining inactivated polio, haemophilus influenzae and hepatitis B vaccines into the product has helped reduce the number of injections received by infants. Combination vaccines have become the mainstay of childhood immunization schedules [15]. In addition, combined vaccines for adults are in common use, such as the quadrivalent influenza vaccine which protects against multiple strains including two influenza A and two influenza B viruses [16].

A combination vaccine has the potential to address some key concerns identified through global studies on barriers to uptake of vaccination, which included access barriers, inconvenience, fear of needles, lack of vaccine offers, and lack of communication [17]. Historically, immunisation uptake has been higher for combined vaccines [18]. Combination vaccines for COVID-19 and influenza are at present in advanced stages of clinical trials and are expected to be available on the market in the near future [20–23]. These combination vaccines may have the potential to be more effective than mono-vaccines, and consequently may result in improved health outcomes for those infected with the pathogens. [22,23].

While there is increasing optimism regarding the potential of combination vaccinations for COVID-19 and influenza, there is also a clear need for the development of appropriate vaccine communication, and health promotion efforts, in order to ensure increased rates of uptake in the general population once they are developed. This is especially pertinent as studies have determined that vaccine hesitancy rates for the COVID-19 and influenza vaccines have been found to be as high as 29.7% and 37.7%, respectively [24,25]. To provide better insights into attitudes toward a combined vaccination, we conducted a systematic review on attitudes, perceptions, and hesitancy towards a combined vaccination for both COVID-19 and influenza.

Methods

For this scoping review, we followed the Preferred Reporting Items for Systematic Review and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) [26,27]. There were numerous steps conducted, which were conducted in the following order:

1. creating the research question
2. developing search terms across the respective databases
3. developing the inclusion and exclusion criteria
4. screening for studies to include and exclude
5. extracting of data from included studies
6. synthesizing findings
7. reporting of findings and implications.

On June 6, 2023, searches were conducted across in ten different databases: PubMed, Scopus, Google Scholar, Embase, OVID Medline, CINAHL, PsycInfo, ScienceDirect, Global Health, and Web of Science. Searches were repeated on August 31, 2024, to ensure that as many relevant articles as possible were included. Search terms pertained to those regarding COVID-19, influenza and

 doi:10.20944/preprints202503.2383.v1

combined vaccination respectively. A full list of search terms, by database, is shown in **Supplementary Table S1.**

Inclusion criteria was intended to be as broad as possible to maximize the number of potential articles to be included. Studies were eligible for inclusion if they provided any perceptions/attitudes towards combination COVID-19-influenza vaccination. Original qualitative, quantitative and mixed-methods studies were all eligible for inclusion. No restrictions were placed based on the number of participants, and the date of publication. Conference abstracts, dissertations, and pre-prints were all eligible for inclusion. Studies were not eligible for inclusion if they were any of the following:

- Not in English
- Not original research (review, commentary, etc.)
- Strictly clinical studies
- Pre-clinical studies
- Only examines perceptions of a single vaccine (i.e. only COVID-19 vaccine or only influenza vaccine)

After conducting the searches, two researchers (KV and IS) screened articles independently. Duplicates were first removed, then articles were thereafter screened by title and abstract. Next, articles were analysed by full text to determine if they met the inclusion criteria. Discrepancies regarding articles to be included were resolved by consensus among the authors.

Data extracted included those on study characteristics, as well as those on participant characteristics/perceptions. Data extracted under study characteristics included study design, objectives, sources of data, sampling method, analyses conducted, and study limitations reported by authors. Participant data that was extracted included total number of participants, gender, age, and attitudes/perceptions/hesitancy towards vaccination. To allow for comparisons, data for attitudes/perceptions/hesitancy were extracted for receiving the influenza vaccination, the COVID-19 vaccination, and the combined vaccination. Data was extracted by three authors (KV, IS, PG) and discrepancies were again resolved by consensus. Once the data was fully extracted, the data was analysed and with trends across data and relevant findings being reported in the text and in tabular format.

Results

Study Screening

Searches across all databases produced a total of 1763 results. Following the removal of duplicates, 1068 articles were screened by title/abstract; of these articles, 30 were analysed by full text. Ultimately, five articles were deemed to be eligible for inclusion in the review [28–32]. Reasons for exclusion of studies were a lack of analysis of attitudes/perceptions regarding vaccinations, and studies only including attitudes/perceptions of a mono-vaccine for either COVID-19 or influenza. A full depiction of the screening workflow is shown in **Figure 1.**

Study Characteristics

A full list of study characteristics is shown in **Table 1.** Of the five studies included in this review, all five utilised an online survey format; four had a cross-sectional design [29–32], and one was a longitudinal cohort study [28]. One study was conducted in 2020 and 2021 [28], one was only in 2021 [31], and two were conducted in 2022 [29,30]. A single study did not specify the time period for data collection [32]. Sample sizes across studies ranged from 600 [32] to 12,287 [31]. Logistic regression was used in four studies to assess for relevant factors associated with vaccination acceptance [28,29,31,32], and one study utilised independent t-testing and chi-square testing to evaluate trends

 doi:10.20944/preprints202503.2383.v1

in data [30]. Common reported limitations across studies included recall bias, sampling bias, a lack of representativeness, and social desirability bias.

Participant Characteristics

Characteristics of participants, including attitudes/perceptions of a combination vaccine, are shown in **Table 2.** Participants from 10 countries were represented (with one study including data from seven countries [29]), which were Italy (2543 participants) [28], Egypt (330 participants) [29], Iraq (330 participants) [29], Kuwait (330 participants) [2], Lebanon (330 participants) [28]9, Morocco (330 participants) [29], Pakistan (330 participants) [29], Afghanistan (330 participants) [29], Sudan (330 participants) [29], Saudi Arabia (330 participants) [29], Yemen (330 participants) [29], Libya (2745 participants) [29,30], United States (12,287 participants) [31], and the United Kingdom (600 participants) [32]. All studies included participants across age groups, with most common groupings being 18-24, 25-34, 35-50, 50-64, and 65+. Of the studies that specified, 9151 participants (45.8%) were male, and 10,830 (54.2%) were female.

Rates of Acceptance

Overall, rates of acceptance for a combination COVID-19 and influenza vaccine ranged from 50.0% [30] to 74.7% [32]. One study evaluating the acceptance of a combination vaccination, with potential of flu-like symptoms as a side effect, demonstrated that 24.1% of participants were willing to accept such a risk (95% CI: 23.0 – 25.2) [32]. The same study also showed that 7.5% would not accept any risk of flu-like symptoms as a side effect [32]. Another study focused solely on acceptance of a combination vaccination among participants who have refused the COVID-19 vaccination. Amongst these 1819 individuals, 512 (28.2%) were willing to accept a combination vaccination instead [30]. Likewise, a study collecting data in 2020 and 2021, demonstrated that 73.7% favoured a combination vaccine [31]. In this study, among the 88.2% of individuals who had previously received a COVID-19 vaccine dose/intended to get the COVID-19 vaccine, 42.2% had received the influenza vaccine in the same year [28].

Table 1. Characteristics of studies included in this review.

Article - country	Study design	Objectives	Sources of data	Sampling method	Analyses conducted	Study limitations (stated by authors)
[28] - Italy	Longitudinal cohort	To determine changes in public attitude, knowledge and beliefs regarding influenza vaccination at different stages of COVID-19 pandemic.	Cross-sectional computer-assisted web interview conducted in 2020 and 2021 with same group of participants.	2543 Italian adults aged ≥18 years drawn from a pool using two-stage probabilistic quota method and who participated in a cross-sectional online survey in 2020.	Repeated measures continuous and dichotomous variables were compared using paired t and McNemar's tests, respectively. Multivariable logistic regression analysis was performed to determine statistically significant associations.	Digital divide bias due to web-based surveys. Recall bias. Participation bias.
[29] – Eastern Mediterranean region (11 countries)	Cross-sectional	To evaluate acceptance of a combined vaccine for influenza and COVID-19.	Online-based survey from September to November 2022, distributed via social media platforms.	Non-random sampling design used with convenience and snowball sampling techniques, with 330 participants per 11 countries.	Multi-logistic regression modelling used to assess factors associated with acceptance of a combined vaccine.	Potential sampling bias, not representative of countries. Recall bias and social desirability bias. Non-random sampling method may have impacted generalizability.
[30] - Libya	Cross-sectional	To explore public attitudes towards COVID19 and influenza vaccines, factors associated with vaccine rejection	Nationwide electronic, anonymized online survey distributed via email, social media, and	Educated adults, aged ≥18 years, living in Libya and having a smart phone or computer with internet access were selected using convenience & snowball sampling approach,	Association between categorical variables was determined using Chi-square test. Means of the two independent groups were compared using independent t-test.	Sampling bias and limited representativeness of data Distortion of self-reported data due to

 doi:10.20944/preprints202503.2383.v1

		and impact of combination vaccine on reducing vaccine rejection.	messaging platforms in 2022.	conducted over a month period in 2022.		recall & social desirability bias Lack of randomization in sampling. Older age groups underrepresented in study.
[31]– United States	Cross-sectional	To determine how acceptable an influenza-COVID-19 combination vaccine is relative to single influenza or COVID-19 vaccine in US ethnic minority groups.	National survey of a large and nationally representative sample of US minority adults, conducted online in 2021, and over telephone in English, Spanish, Chinese, Korean and Vietnamese.	Large nationally representative samples of White and minority groups were generated using pre-stratification randomized quota sampling. Final sample was balanced with known demographic estimates for each ethnic group by adding post-stratification weights. Survey conducted over one month in 2021.	Dependent variables, control variables and theoretically central predictors were described using descriptive statistics. Characteristic traits of individuals likely to accept vaccination was measured using logistic regression analysis.	Reduced generalizability due to cross-sectional nature. Unable to establish causal relationships between factors & outcomes. No reasons provided for low and high intent to vaccinate.
[32] – United Kingdom	Cross-sectional	To evaluate and quantify the preferences for a combination influenza and COVID-19 vaccination.	Preference was evaluated using a threshold technique series that was part of a wider stated-preference survey.	Across the United Kingdom, unspecified further.	Choices were statistically analyzed with the usage of descriptive statistics and interval regression.	Unspecified.

Table 2. Key findings and characteristics of participants from studies included in this review.

Article - Country	Participant Total	Gender (M/F)	Age	Attitudes, perceptions, and hesitancy of COVID-19 vaccination	Attitudes, perceptions, and hesitancy of influenza vaccination	Attitudes, perceptions, and hesitancy of combined vaccination
[28] - Italy	1979	1086/893	*Age group:* 18-24: 113 24-34: 321 35-44: 374 45-54: 469 55-64: 375 65-74: 249 ≥75: 78 Mean age in years: (SD): 48.3 (15.1)	Refusing vaccination: 233 (11.8%) Received at least 1 dose: 805 (40.7%) Booked their vaccine: 357 (18.0%) Going to book vaccine as soon as possible: 584 (29.5%)	Willingness vs uptake, correlations with 2020 survey: 84.9% of those who stated in 2020 that would get influenza vaccine, did so (willingness to actual uptake). Likewise, 88.9% of those who stated they would not get it, did not. Of those who stated "probably yes" 47.3% did receive influenza vaccine- of this group, those who did not get vaccinated were younger (44.6 vs 56.7 years)- effect size large (d=0.82). Of 282 who stated "I do not know" 18.1% were vaccinated, of 444 who stated "probably not", 17.8% were vaccinated. Of the 380 who stated "definitely not" 11.1% were vaccinated. Those who had/intended to receive COVID-19 vaccination, 42.2% had been vaccinated against influenza in 2020/21. Participants who stated no intention to receive COVID19 vaccination, 10.3% had received 2020/21 flu shot. Statistically significant 4-fold difference, effect size large (OR 6.35).	Favoring a combination vaccine for COVID-19 and influenza: 73.7%

 doi:10.20944/preprints202503.2383.v1

					Attitudes against flu shot: 12.9% feel flu shots are to profit pharmaceuticals.; 5.5% have fear of needles.; 7.0% said doctors recommendation not to receive.; 13.9% believe flu has diminished since covid so it isn't necessary; 12.0% believe flu shots don't work. 5.5% had the shot but got sick anyway.	
[29] – Eastern Mediterranean region (11 countries)	3300	1302/1998	*Age group:* 18-24: 1343 25-34: 925 35-49: 671 50-64: 249 65+: 112	Unspecified	Unspecified	*Reasons for acceptance:* *More than 66% favored a combination vaccination.* It would be less costly (9%), safer (18%), have more effectiveness (17%) and required fewer doses (19%). *Reasons for wanting doses separately: Potential side effects (31%), a lack of studies published on the effects of a combined vaccination (31%).* *Variation in acceptance across groups:* Highest rates of acceptance seen in ages 18-24: 45.8%, followed by above 65 years: 45.5% ($p<0.05$). Those aged 50-65 had lower odds of accepting compared to those 18-24 (OR = 0.55, 95% CI: 0.39-0.80). Males more likely to accept than females (50% compared to 39%, $p<0.05$). (OR = 1.21, 95% CI: 1.03-1.42). Those with higher education were more likely to accept the combination ($p<0.05$). Those with chronic disease/past COVID-19 infection were more likely to reject the combination ($p<0.001$). Having COVID-19 in the past decreased odds of acceptance by 21% (OR = 0.79, 95 CI: 0.65-0.95). Those who had a family member die from COVID-19 had 22% higher odds of acceptance compared to those who did not (OR = 1.22, 95% CI: 1.03-1.44) Countries with highest rates of acceptance: Morocco, Sudan, Afghanistan, and Pakistan. Countries with lowest rates were Kuwait (30%), and Lebanon (22%).
[30] - Libya	2415	755/1660	*Age group:* 18-24: 832 25-34: 950 35-50: 566 50-65: 67	*N (%) accepting vaccination* Age 18 to less than 25 years: 188 (22.6) 25 to less than 35 years: 191 (20.1) 35 to less than 50 years: 180 (31.8) 50–65 years: 37 (55.2) Female: 371 (22.3) ; Male: 225 (29.8)	*N (%) accepting vaccination* Age 18 to less than 25 years: 374 (44.8) 25 to less than 35 years: 338 (35.6) 35 to less than 50 years: 267 (47.2) 50–65 years: 32 (52.2) Sex: Female: 673 (40.5) ; Male: 340 (45.0) Marital status: Divorced: 45 (49.5); Married: 463 (41.8); Single: 505 (41.5)	*Among 1819 participants who refused COVID-19 vaccination* N (%) willing to accept COVID19 + influenza vaccinations: 512 (28.2) N (%) rejecting COVID19 + influenzas vaccination: 1307 (71.85) *Reasons for acceptance N (%)* Combination considered safe: 261 (51) Combination has fewer injections: 123 (24) Combination more effective: 98 (19.1) Combination less expensive: 17 (3.3)

 doi:10.20944/preprints202503.2383.v1

				Marital status: Divorced: 24 (26.4) Married: 273 (24.6); Single: 299 (24.6) Previous COVID19 infection: No: 521 (24.1); Yes: 75 (29.8); Do not know: 105 (21.2) Relatives died due to COVID-19: No: 285 (25.1); Yes: 206 (26.2); Do not know: 20 (17.5) Chronic diseases: No: 290 (25.0); Yes: 286 (25.1) *N (%) rejecting vaccination* Age 18 to less than 25 years: 644 (77.4) 25 to less than 35 years: 759 (79.9) 35 to less than 50 years: 386 (68.2) 50–65 years: 3 (44.8) Sex: Female: 1289 (77.7); Male: 530 (70.2) Marital status: Divorced: 67 (73.6); Married: 835 (75.4); Single: 917 (75.4) Previous COVID-19 infection; No: 1642 (75.9); Yes: 177 (70.2); Do not know: 391 (78.8) Relatives died due to COVID19: No: 849 (74.9); Yes: 579 (73.8); Do not know: 94 (82.5) Chronic diseases: No: 870 (75.0) Yes: 855 (74.9)	Previous COVID19 infection: No: 902 (41.7); Yes: 111 (44.0); Do not know: 175 (35.3) Relatives died due to COVID19: No: 519 (45.8) Yes: 319 (40.6); Do not know: 48 (42.1) Chronic diseases: No: 492 (42.4); Yes: 473 (41.5) *N (%) rejecting vaccination* Age 18 to less than 25 years: 459 (55.2) 25 to less than 35 years: 612 (64.4) 35 to less than 50 years: 299 (52.8) 50–65 years: 32 (47.8) Sex: Female: 987 (59.5); Male: 415 (55.0) Marital status: Divorced: 46 (50.5) Married: 645 (58.2); Single: 711 (58.5) Previous COVID19 infection: No: 1261 (58.3); Yes: 141 (56.0); Do not know: 321 (64.7) Relatives died due to COVID19: No: 615 (54.2); Yes: 141 (56.0); Do not know: 321 (64.7) Chronic diseases: No: 668 (57.6); Yes: 668 (58.5).	*Causes for rejection N (%)* Fear of side effects: 529 (48.7) Absence of studies proving effectiveness: 324 (29.8) Combination may be useless: 147 (11.2)
[31] – United States	12,287	6008/6279	Median age: 35-39	*% accepting vaccination* Overall: 45 F: 47.4 M: 52.6 Black/African Am: 39 Asian Am & Pacific Islander: 53 Latino/a: 46 Native Am./ Am. Indian: 37 White (only): 45 High school or less: 36.6 Some college, not graduate: 41.4	*% accepting vaccination* Overall: 58 F: 48.5 M: 51.5 Black/African Am: 52 Asian Am & Pacific Islander: 69 Latino/a: 54 Native Am./ Am. Indian: 52 White (only): 60 High school or less: 52.5 Some college, not graduate: 53.2 College graduate/ post graduate degree: 71.6 Above median income: 65.10	Factors associated with acceptance: political identification as democrat (OR = 2.04, p<0.001), earning more than the median income (OR = 1.29, p<0.01), being older than 60 years of age (OR = 1.37, p<0.01), having a college education (OR = 1.74, p<0.001), always getting the flu shot annually (OR = 18.7, p<0.001), getting the flu shot some years (OR = 7.03, p<0.001), and usually not getting the flu shot (OR = 2.58, p<0.001). Factors associated with not wanting to get the combined vaccine: being Black/African American (compared to being White) (OR =0.60, p<0.001), being female compared to being male (OR = 0.65, p<0.001) living in a small town/city (compared to being in a city) (OR = 0.78,

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				College graduate/ post graduate degree: 59.3 Above median income: 65.69 Below median income: 34.31 Democrat: 49.4 Independent: 21.9 Republican: 24.8 Large city/urban area: 50.3 Suburb near large city: 46.9 Small town/ small city: 43.5 Suburb near small town/city: 39.9 Rural area: 31.7	Below median income: 34.90 Democrat: 43.7 Independent: 23.5 Republican: 28.9 Large city/urban area: 64.1 Suburb near large city: 60.7 Small town/ small city: 54.4 Suburb near small town/city: 54.0 Rural area: 47.5	p<0.05), and living in a rural area (OR = 0.63, p<0.05) *% accepting vaccination* Overall: 50 Gender: Female: 45.7; Male: 54.3 Race: Black/African Am: 42; Asian Am & Pacific Islander: 60; Latino/a: 51; Native Am./ Am. Indian: 44; White (only): 50 Education: High school or less: 42.6; Some college, not graduate: 44.7; College graduate/ post graduate degree: 65.1 Income: Above median income: 63.82 ;Below median income: 36.18 Political affiliation: Democrat: 48.1; Independent: 22.5; Republican: 25.8 Urban/rural status: Large city/urban area: 57.1; Suburb near large city: 53.4; Small town/ small city: 44.9; Suburb near small town/city: 46.6; rural area: 33.6
[32] – United Kingdom	600	Unspecified	Age groupings: 18-49: 200 50-64: 200: 65+: 200	Unspecified	Unspecified	448 (74.7%) preferred the combination vaccine over a multiple mono-vaccines. Participants were willing to accept a maximum flu-like symptom side-effect risk of 24.1% (95% CI: 23.0-25.2). 7.5% would not accept any flu-like symptom side effect. Higher education, and previous vaccinations increased one's tolerance to risk, whereas those with comorbidities/risk for flu complications were less tolerant to risk.

Factors Associated with Acceptance

Differences in rates of acceptance of a combination vaccinated were noted across age groups, with those above 60 years of age found to be associated with acceptance in two studies [29,30]. Males were also shown to be 21% more likely to accept combination vaccination than females in one study [29]. Compared to those who have never had the flu vaccination, those who always receive the flu shot annually were 1770% more likely to accept a combination vaccine; those who get the flu shot in some years were also more likely to accept the combination vaccine (OR = 7.03, p<0.001), as well as those who usually do not get the flu shot (OR = 2.58, p<0.001) [31]. Other factors demonstrated to be associated with acceptance were political identification as a Democrat (in the United States), earning above the median income, having had a family member who died from COVID-19, and having had higher educational attainment [29,30]. A study on acceptability of risk for side effects from a combination vaccine demonstrated that higher education and having previously been vaccinated for COVID-19 and influenza were associated with increased tolerance to risks for side effects [32].

Factors Associated with Rejection

Being in an at-risk population appeared to be associated with rejection of a combination vaccination; in one study, it was shown that those with chronic disease and/or past COVID-19 infection were more likely to reject the combination vaccine (p<0.001). [29]. The study demonstrated that having had COVID-19 infection in the past was associated with 21.0% decreased odds of acceptance (OR = 0.79, 95 CI: 0.65-0.95) [29]. Similarly, another study demonstrated that those with

 doi:10.20944/preprints202503.2383.v1

comorbidities/risks for flu complications were the least tolerant to any risks of a combination vaccination's side effects [32].

Another study determined demographic factors associated with hesitation toward the combination vaccine included: being Black/African American (compared to being White) (OR =0.60, p<0.001), being female compared to being male (OR = 0.65, p<0.001) living in a small town/city (compared to being in a city) (OR = 0.78, p<0.05), and living in a rural area (compared to being in a city (OR = 0.63, p<0.05) [30]. Among the 11 countries in the Middle East region surveyed in one study, the lowest rates of acceptance were shown in Kuwait (30%) and Lebanon (22%) [29].

Reasons for Acceptance and Refusal

Four main reasons for acceptance of combination vaccines were described across included studies. Combinations were considered safer among 51% of those who would accept a combination vaccine in one study [30], and 18% in another study [29]. Lower costs were a reason specified by 3.3% [30] and 9.0% of participants [29]. Increased effectiveness was also specified among 19.1% [30], and 17% [29]. Lastly, requiring fewer overall doses were also described among 24.0% [30] and 19.0% of those who would be willing to accept a combination vaccine [29].

Reasons for refusal of a combination vaccine were also described. One study indicated that the three main reasons, among those who self-reported rejecting a combination vaccine, were fear of side-effects (48.7%), lack of studies demonstrating effectiveness (29.8%), and perceptions that a combination vaccine may be useless (11.2%) [30]. A further study had comparable findings, with 31% of those who rejected a combination vaccine specifying that this was due to fear of side effects, with a further 31% describing concerns over a lack of data published on the effectiveness of a combined vaccine [29]. Notably, another study highlighted specific additional reasons for participant rejection of the influenza vaccination (though these factors were not solely linked a combination vaccine); 12.9% felt that flu shots are to profit pharmaceuticals, 5.5% have fear of needles, 7.0% said doctors recommended not to receive the influenza vaccine, 13.9% believed that the flu has diminished since COVID-19, so it isn't necessary, 12.0% believe flu shots don't work, and 5.5% had the shot but got sick anyway [28].

Discussion

In this review, it has been shown that there are favourably high rates of acceptance towards a combination vaccination for COVID-19 and influenza. Convenience, affordability, and safety were described as important contributing factors towards acceptance of a combination vaccine against COVID-19 and influenza viruses. However, despite these notable rates of acceptance for a combination vaccine, it is also important to denote that a sizeable proportion of participants stated that they did not desire to receive such a combination vaccine.

Our review has shown that several demographic groups appear to be especially reluctant towards a combination vaccine. These include residing in a rural area, being a racial minority, having comorbidities, being female, and having previously had infection with COVID-19. This has important implications and suggests that vaccine delivery programs should be connected with health promotion campaigns and communication efforts that attempt to reach out to these groups, who may be reluctant. Increased public health messaging, along with provision of support to groups who may have had lower vaccination rates overall, may have a valuable role in increasing uptake for a combination vaccine. Notably, it has been shown that those who have never had a flu vaccination are considerably less likely to accept a combination vaccine than those who have had it in the past. Therefore, efforts should focus on promoting the combination vaccine, but also on emphasizing the importance of the annual flu vaccination more generally.

The reasons for refusal of a combination vaccine also need to be evaluated. As a fear of side-effects and low overall effectiveness were described in studies, it is clear that – along with ensuring that these vaccines (once developed) will be safe and provide optimal protection in comparison to mono-vaccines – there needs to be effective health communication to all populations address

 doi:10.20944/preprints202503.2383.v1

misconceptions about the vaccines. This will entail distributing messages across populations of their safety, but also addressing potential misinformation regarding perceptions of dangers of such a vaccination. As well, there is also a need to consider factors such as a fear of profiteering, which was discussed in one study [28]. Addressing of misinformation will be of pertinence considering that, since the emergence of COVID-19 vaccines, there have been significant misperceptions regarding the vaccination that have become widespread in numerous segments of populations [33]. Considering that all of the included studies in this review were observational, it would be of high utility for future research to also be conducted to evaluate interventions that attempt to address reluctance for a future combination vaccine. Such interventions may have a powerful role in shaping health policy at the government levels.

Alongside the overall strengths and implications of this review, it is also important to consider limitations. Our review was limited to five studies, four of which had a cross-sectional study design. Therefore, many of the findings may not be able to accurately elucidate how attitudes towards vaccination change and develop over time. Furthermore, the small number of studies means there is a need for further evaluation of the factors associated with acceptance and refusal of a combination vaccination. These studies should ideally be longitudinal in nature but should also involve a qualitative design so that perceptions can be more thoroughly understood overall. An additional limitation to this review was that all the studies reviewed utilised a survey methodology for data collection, which has potential to impact results due to social desirability bias and recall bias. Connected to this point, there is currently no combination COVID-19 and influenza vaccination available, and so the data regarding perceptions is only for a theoretical, future vaccination. Hence, it is important that future studies continue to evaluate perceptions of a combination vaccine after it has become available for the general population. Furthermore, it is important that studies evaluate the differences between perceptions/attitudes, and actual uptake of the vaccination.

In spite of the overall limitations of this review, it is worthwhile to acknowledge that this work can provide valuable insights to scientists and those in public health regarding how success can be optimised for a combination COVID-19 and influenza vaccination. These insights can also offer utility for other future combination vaccinations and their respective delivery programs. Overall, this can help to contribute to improved health outcomes across populations.

Conclusion

In this review, it has been shown that there are relatively high rates of acceptance of a combination vaccination for COVID-19 and influenza. However, rates are considerably lower among specific demographics, with reasons for refusal including concerns about effectiveness, safety, and cost. Once a combination vaccination becomes available, it will be pertinent that public health messaging works to clear misconceptions regarding the vaccination while also ensuring that communication is specifically provided to groups that may have initial reluctance towards the vaccine. These efforts can have a valuable role in improving vaccination rates, and therefore contributing to decreases in morbidity and mortality due to both COVID-19 and influenza.

Supplementary Materials: The following supporting information can be downloaded at the website of this paper posted on Preprints.org.

Conflicts of interest: The authors have no conflicts of interest to disclose.

Funding: No financial assistance or funding was provided for this review.

 doi:10.20944/preprints202503.2383.v1

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