Review Article

Impact of educational interventions on the prevention of emerging diseases: A systematic review

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Abstract

Background: Seasonal influenza and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) could cause considerable morbidity and mortality. The present study investigates the effectiveness of educational interventions to prevent these diseases.

Materials and Methods: We searched PubMed/Medline, Embase, and Cochrane Controlled Register of Trials (CENTRAL) for relevant clinical studies up to March 25, 2022. The following terms were used: “influenza”, “flu”, “respiratory infection”, “prevent”, "severe acute respiratory syndrome", COVID-19 “intervention”, “education”, “school-based”, and “inform”.

Results: Out of 1296 studies retrieved from databases, 13 types of clinical trials met the inclusion criteria and were included in the study. E-learning and the educational module were the most common interventions for influenza and COVID-19, respectively. The measured outcomes were health promotion strategies and preventive behaviors among participants. All except one article showed a significant association between educational interventions and outcomes.

Conclusion: The included studies in the current systematic review indicated the efficacy of health promotion educational interventions in improving knowledge and preventive behaviors regarding COVID-19 and Influenza.

Keywords: COVID-19, Influenza, Education, Prevention

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Introduction

Designing effective interventions for various diseases has become even more important during the COVID-19 pandemic. Health education can improve people’s knowledge of infectious diseases and consequently promotes the development of appropriate preventive behaviors[1-2].

Yearly influenza outbreaks are a prime example of a public health problem with well-developed surveillance methods and evidence-based programs for prevention[3-4]. Fifty-five million adults aged 18 to 64 are infected with influenza every year[4]. Influenza vaccination among healthy, working adults is highly effective, resulting in a 25% reduction in an episode of upper respiratory illness[5]. Nonetheless, vaccination rates are

about 20% among healthy adults and 45% among those with high-risk conditions[5].

Over 11 billion vaccine doses were administered worldwide by May 1, 2022, to relieve the burden of COVID-19 and the depletion of medical resources[6]. Nonetheless, people's knowledge of COVID-19 disease and vaccines may affect their adherence to public health measures. Therefore, effective health education remains essential in the COVID-19 era.

Several randomized controlled trials (RCTs) have been undertaken to determine the efficacy of educational intervention on COVID-19 and influenza prevention. However, there have been different results about the efficacy of the educational intervention. Therefore, the present study investigates the effectiveness of educational interventions to prevent these diseases.

Methods

This review conforms to the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA) statement[7].

Search strategy: The English medical literature search was carried out in PubMed/Medline, EMBASE, and the Cochrane Controlled Register of Trials (CENTRAL) up to March 25, 2022.

The following terms were used: "influenza", "flu", "respiratory infection", "prevent", "severe acute respiratory syndrome", COVID-19 "intervention", "education", "school-based", and "inform". Lists of references of selected articles and relevant review articles were hand-searched to identify further studies.

Study Selection: The records found through database searching were merged, and the duplicates were removed using EndNote X7 (Thomson Reuters, Toronto, ON, Canada). Two reviewers independently screened the records by title/abstract and full text to exclude those unrelated to the study topic. Clinical trial studies were selected to investigate the relationship between education and influenza or COVID-19.

The outcome assessed was the improvement of knowledge and preventive behaviors among participants. The exclusion criteria were: conference abstract, case report, and reviews.

Data extraction: Two reviewers designed a data extraction form and extracted data from all eligible studies, resolving differences by consensus. The following data were extracted: first author, country of origin, type of study, inclusion period, the definition of case and control, the total number of controls and cases, type of intervention, and outcomes.

Quality assessment: Two reviewers assessed the quality of the studies independently using the Cochrane tool [8].

Results

Thirteen articles were included, which is shown in Figure 1. The studies were classified into 11 RCT and two quasi-experimental studies. The outcome assessment was different between articles. Although the educational interventions were highly variable and often multimodal, all addressed and emphasized that educational interventions are successful in influenza and COVID-19 prevention (Tables 1-2).

All studies implemented a promotional program with E-learning or informative content and reminders of at least one intervention. Visual media characterized the E-learning module (e.g., information leaflets, posters, video/live demonstration).

Quality of included studies: The risk of bias assessment of the experimental studies according to the Cochrane tool is presented in Table 3. Only four studies have a high risk of bias in allocation concealment, participant blinding, and outcome blinding (Table 3).

Educational interventions and improvement of knowledge or preventive behaviors: There were different outcomes in studies related to Influenza. In the study conducted by Ferguson et al., they provided a 5-minute education session to participants in the intervention group to increase their awareness and attitude toward preventive measures[9]. Bourgeois et al. indicated that the educational intervention could not significantly improve participants' knowledge and preventive behaviors compared to the control group. In another quasi-experimental study conducted by Kim et al. on rural elderly individuals, a health education program aimed at preventing respiratory infections with four weekly sessions and a reinforcement session one to six months after the initial training led to a significant increase in respiratory infection prevention practices[10]. In a study by Sadeghi et al. on pregnant women, informative content, including the definition of flu, its symptoms, transmission, prevention, diagnosis, and

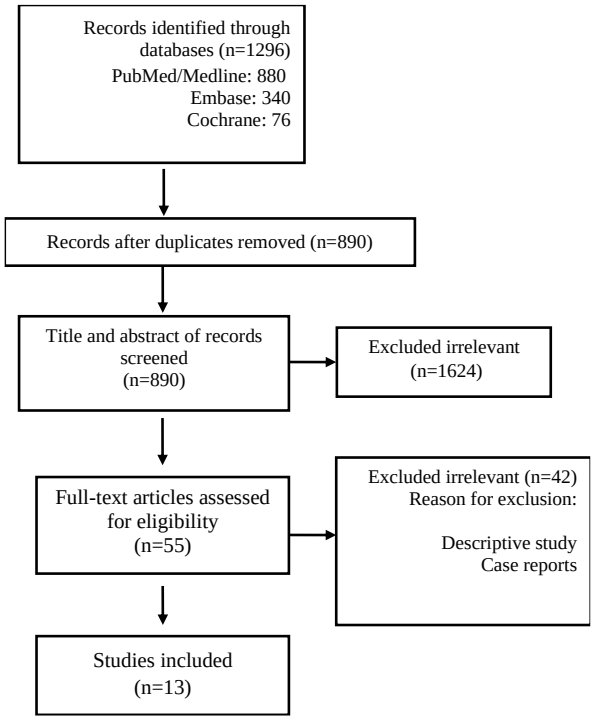

Figure 1. Flow chart of study selection for inclusion in the systematic review.

treatment, was educated within two weeks in the intervention group, which caused significant improvement in knowledge and preventive behaviors[11]. In another study, Wang et al. designed an education program for children, including playing promotion cartoons, developing lectures, giving out handbook copies, and making hand copies and blackboard newspapers, which was held monthly for one year and led to significant improvement in behavior toward respiratory infectious disease in the intervention group[12].

In studies related to COVID-19, there was a significant improvement in the intervention groups in the knowledge subscale of the health promotion strategies compared with the control group.

Discussion

The present study found that educational interventions show efficacy for COVID-19 and influenza prevention by improvement of knowledge or preventive behaviors.

Schensul et al. showed that the educational intervention achieved most of its desired goals at all levels. It significantly increased pro-vaccination knowledge, beliefs, and norms, increasing correct social thoughts toward vaccination. It reduced vaccination fears among peer implementers and participating residents and finally improved the vaccination rate in the intervention building[13].

A South Korean survey reported highly positive outcomes of an educational program for respiratory infection prevention among rural elderly residents [10]. The reasons for the program's high efficacy were that it was developed based on the processes of observational learning. Key concepts from this theory, such as imitation, cognition, reinforcement, and self-efficacy, were also applied to the development of the program. This approach was previously applied to increase compliance with respiratory infection prevention practices[14].

A Chinese study reported the efficacy of health education on the knowledge and behavior of students toward infectious diseases[12]. In their study, educational interventions lead to positive outcomes. Likewise, Ferguson et al. showed that a brief information session nested in a broader educational forum increased knowledge and acceptability of prevention methods, particularly family influenza vaccination, with an associated increase in household vaccination evident[9].

Although in another study conducted in the United States, the intervention did not have a statistically

Table 1: The association of educational interventions on the improvement of knowledge or preventive behaviors for Influenza.

Author	year	country	Type of study	Participants' age category	Educational intervention type	Association of educational intervention on knowledge and preventive behaviors
Ferguson *(9)*	2010	Australia	RCT	Adult/children	Educational sessions and informative content	Yes
Bourgeois *(15)*	2008	USA	RCT	Adult	Informative content	No
Kim *(10)*	2020	South Korea	RCT	Adult	Educational sessions and informative content	Yes
Sadeghi *(11)*	2017	Iran	RCT	Adult	Educational sessions and informative content	Yes
Wang *(12)*	2016	China	RCT	Children	Educational sessions and informative content	Yes

Table 2: The association of educational interventions on the improvement of knowledge or preventive behaviors for COVID-19.

Author	year	country	Type of study	Participants' age category	Educational intervention type	Association of educational intervention on knowledge and preventive behaviors
Chen *(16)*	2022	China	RCT	Both	Video learning/ E-learning	Yes
Alsan *(18)*	2020	USA	RCT	Adult	Video learning/ E-learning	Yes
Torres *(19)*	2020	USA	RCT	Adult	Video learning/ E-learning	Yes
Egan *(20)*	2020	UK	RCT	Adult	Video learning/ E-learning	Yes
Suppan *(21)*	2020	Switzerland	RCT	Adult	Video learning/ E-learning	Yes
Alotaibi *(22)*	2021	Kuwait	RCT	Adult	Informative content	Yes
Wang *(17)*	2020	China	RCT	Adult	Informative content	Yes
Yu *(16)*	2021	China	RCT	Adult	Informative content	Yes

significant effect on the knowledge elements assessed; however, it did have a considerable effect on certain beliefs surrounding influenza [15].

In a study regarding COVID-19, small-town residents had relatively poor knowledge of the clinical manifestations and transmission routes of COVID-19 and good knowledge of prevention and control measures. However, after the intervention (reading the leaflet), people's knowledge about COVID-19 improved significantly [16]. Furthermore, in the subsequent study, the training model could effectively enhance practical skills in COVID-19 prevention[17].

There are some limitations in the current systematic review. Some studies used education methods that were not easy for the population. For example, older adults were less likely to use modern educational methods. Other limitations of the studies were different settings and methodologies. Finally, potential factors that lead to overall heterogeneity were not examined.

Conclusion

The findings of our systematic review suggest that health promotion educational interventions can

Table 3: Quality assessment of the experimental studies included in the meta-analysis (the Cochrane tool).

Author	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Chen (16)	Low risk	High risk	Low risk	Low risk	Low risk	Low risk	Low risk
Alsan (18)	Low risk	High risk	High risk	High risk	Low risk	Low risk	Low risk
Torres (19)	Low risk	High risk	High risk	High risk	Low risk	Low risk	Low risk
Egan (20)	Low risk	High risk	High risk	High risk	Low risk	Low risk	Low risk
Suppan (21)	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Alotaibi (22)	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Wang (17)	Low risk	High risk	High risk	High risk	Low risk	Low risk	Low risk
Yu (16)	Low risk	High risk	High risk	High risk	Low risk	High risk	Low risk
Ferguson (9)	High risk	High risk	High risk	High risk	Low risk	Low risk	Low risk
Bourgeois (15)	Low risk	High risk	High risk	High risk	Low risk	Low risk	Low risk
Kim (10)	High risk	High risk	High risk	High risk	Low risk	Low risk	Low risk
Sadeghi (11)	Low risk	High risk	High risk	High risk	Low risk	Low risk	Low risk
Wang (12)	Low risk	High risk	High risk	High risk	Low risk	Low risk	Low risk

improve knowledge and prevention regarding COVID-19 and Influenza.

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