

Prevalence of human influenza virus in Iran: Evidence from a systematic review and meta-analysis



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ARTICLE INFO

Keywords:

Influenza
Prevalence
H1N1
H3N2
Meta-analysis
Drug resistance

ABSTRACT

This systematic review and meta-analysis was conducted to consolidate the information on the prevalence of the human influenza virus, including H1N1 and H3N2 as well as B-type influenza across Iran from 2000 to December 2016. The literature search was based on keywords including “influenza and Iran”, “human influenza”, “prevalence”, “relative frequency”, “incidence”, and “drug” in MEDLINE (PubMed), Web of Science, Scopus, ScienceDirect, the Iranian Research Institute for Information Science and Technology (IranDoc), the Regional Information Centre for Science & Technology (RiCeST), and the Scientific Information Database (SID). The literature search revealed 25 prevalence and seven drug resistance studies. In order to investigate the publication bias among studies, funnel plots and Egger's test were used. Additionally, the statistical tests of I^2 , Chi^2 , and Tau^2 were computed, and the results were visualized with forest plots. A high level of I^2 and Chi^2 were obtained among studies, which are representative of the high variation and remarkable heterogeneity between studies. This may be because of various methodologies applied in the studies such as study design, age groups, and different populations.

The prevalence of influenza H1N1, H3N2, and B in Iran have not yet been well evaluated. The heterogeneity among studies reveals that more attention should be paid to considering various factors, including gender, population size, and underlying conditions.

1. Introduction

The influenza virus is an epidemic infectious agent that belongs to the Orthomyxoviridae family [1]. Until now, three types of influenza viruses, including A, B, and C have been classified based on their immunological and biological properties [2,3]. The first two types, A and B, cause annual epidemics and affect people's lives and the economy while the type C virus has fewer effects [4].

The most frequent type of influenza virus that causes infections all over the world is type A [5]. Further classification of type A influenza viruses is based on the presence of two proteins on the virus surface, the hemagglutinin, or “H” protein, and the neuraminidase, or “N” protein. Therefore, H1N1 and H3N2 are known as the seasonal influenza A virus subtypes [6]. In April 2009, a new swine-origin H1N1 influenza A virus

was detected in Mexico, which was called pandemic H1N1 (pH1N1). After that, the World Health Organization declared a pandemic phase due to pH1N1 propagation across different regions in Iran [7]. However, the H3N2 subtype has usually represented the predominant influenza A strain throughout the season [5]. Although there is limited information on the epidemiology and pattern of influenza B circulation in most countries, seasonal mortality due to influenza B-attributable respiratory illness was reported as 29% in the United States [8].

Influenza viruses have a more significant effect on communities than other common respiratory illnesses due to their capacity to be fatal and their highly contagious nature [9,10]. The economic aspects of the influenza burden are notable during both pandemics and seasonal epidemics. Hence, the influenza virus is considered a major global health threat [11,12].

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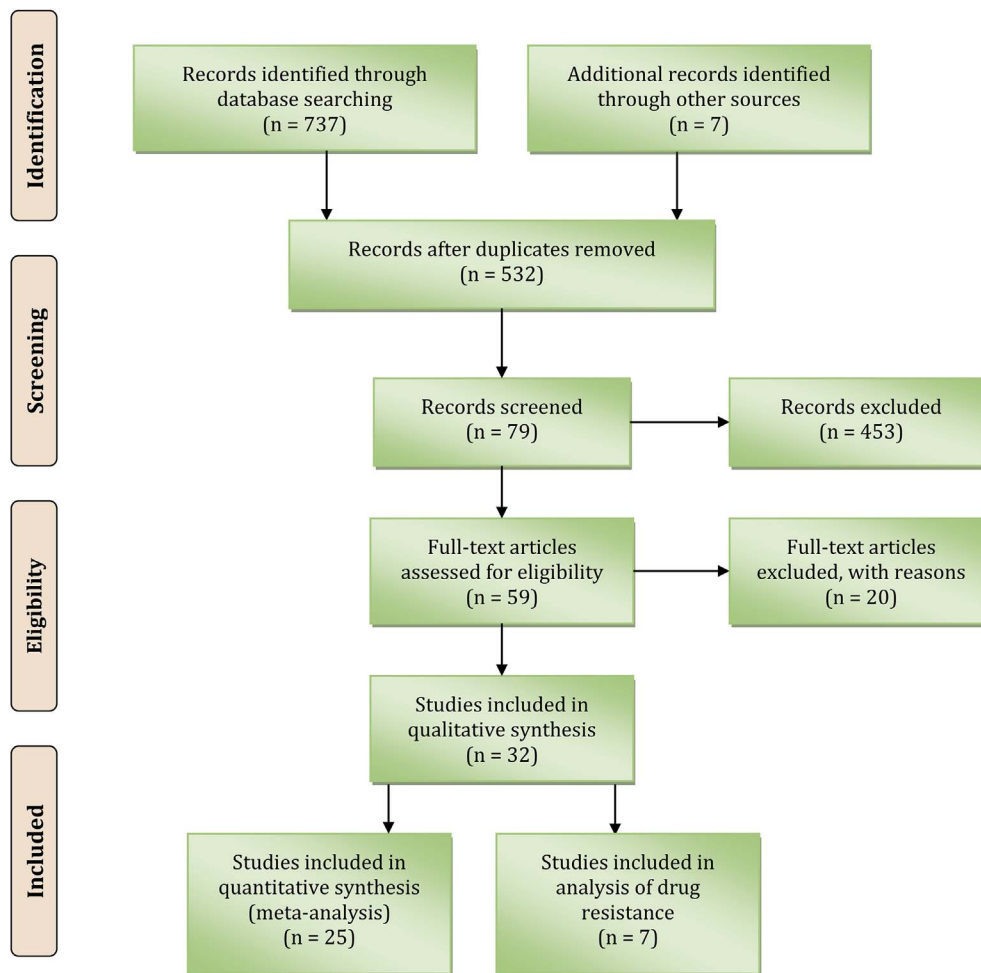


Fig. 1. Schematic representation of the conducted steps for selection of studies.

Information about the clinical features and epidemiological aspects of human influenza infection indicates variability in different geographical regions. Therefore, a systematic review and meta-analysis can provide a deeper understanding and a better perspective of influenza infection. The present data will assist in control, protection, and prevention of influenza prevalence events.

To the best of our knowledge, there is no overall estimation of human influenza infection prevalence among the Iranian population. This study was conducted to consolidate the information on the prevalence of the human influenza virus across Iran.

2. Material and methods

2.1. Study question

This study aims to survey the prevalence of three major human influenza viruses (A/H1N1, A/H3N2, and B) in Iran. Another objective is the investigation of drug resistance to common medications used for influenza treatment.

2.2. Search strategy

In our study, we review published articles from 2000 until December 2016, in both English and Persian. A comprehensive search on influenza prevalence in Iran was carried out in the main electronic databases, including MEDLINE (PubMed), Web of Science, Scopus, and ScienceDirect. The keywords and terms used in this study include “influenza and Iran”, “human influenza”, “prevalence”, “relative frequency”, “incidence”, and “drug”. Additionally, all of the relevant

references cited in the original articles were explored manually to locate other articles that were not indexed by the mentioned databases. The reports were reviewed and managed with EndNote X7.1 (Thomson Reuters).

2.3. Gray literature search

Iranian databases, including the Regional Information Centre for Science & Technology (RICeST), the Scientific Information Database (SID), and the Iranian Research Institute for Information Science and Technology (IranDoc) were searched to find relevant research projects, dissertations, scientific reports of congresses, and organization reports.

2.4. Inclusion and exclusion criteria

To acquire reliable articles, the following criteria were considered: 1) studies must have reported data on flu-like syndromes; 2) the study reports the prevalence of influenza containing the influenza A/H1N1, A/H3N2, and B subtypes. Furthermore, reports including the assessment of resistance to human influenza medications were taken into account. The exclusion criteria were studies on individuals who were infected with avian influenza. The reports regarding the prevalence of animal influenza as well as reviews that did not contain original research data were also excluded.

2.5. Data extraction

In order to collect the data, two independent investigators screened articles at three levels: title, abstract, and main text. The following

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