



Influenza vaccination among healthcare workers

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The main aim of this study was to find information to encourage healthcare workers globally to get vaccinated against influenza. The objective of this study was to explore the adherence of healthcare workers to immunization measures and to seek the motivating factors to promote the influenza vaccination among healthcare workers. Although the vaccination against influenza is the best precaution to prevent the spread of influenza infection, statistics show that the number of vaccinated healthcare workers is still low. Infectious diseases like influenza, can be easily transmitted and spread over through droplets from one person to another. To reduce the risk of infection, vaccination against influenza is necessary.

Integrative literature review was chosen as the method to complete the study. The data were collected from four different databases in April 2021: CINAL with full text (EBSCO), ProQuest Central, Science Direct (Elsevier) and PubMed. Sixteen studies were included after the inclusion and exclusion process where ten studies were observational studies, four were systematic literature reviews and two studies were qualitative studies. Quality assessment for the observational studies was done by using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE), Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was used to assess the quality of the systematic literature reviews and Critical appraisal skills programme CASP (B) was used for assessing the quality of the qualitative studies.

The factors influencing vaccination acceptance among healthcare workers were demographic factors such as age, gender, chronic illness, knowledge of influenza and vaccination and confidence to vaccination while factors affecting vaccination acceptance were lack of knowledge, fear and doubt, and false beliefs. Educational programmes, communication, encouragement, and access to vaccination were found to be the intervention to promote the vaccination acceptance among healthcare workers.

Therefore, to increase the rate of vaccination among healthcare workers globally, these findings can support healthcare institutions in motivating their employees to get vaccinated against influenza.

Keywords: Influenza vaccination, healthcare workers, integrative literature review

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1 Introduction

Health care workers play the most important role in the prevention and control of infectious diseases. While receiving the healthcare treatment no one should get an infection (World Health Organization 2020) and at the same time the self-protection of healthcare workers is equally necessary while taking care of the patients. Infectious diseases like influenza, can be easily transmitted and spread over through droplets from one person to another. To reduce the risk of infection, vaccination against influenza is necessary. (Central for Diseases Control and Prevention 2020.)

Influenza is an acute respiratory disease caused by the influenza virus. The severity of illness caused by this disease can lead a person to hospitalization and even death. Influenza can be easily transmitted from person to person via direct contact with the secretion such as droplets of fluids released while coughing and breathing and also easily spread from the secretion on hands, tissues and surfaces that people touch. (European Center for Diseases Control and Prevention 2020.)

Many studies have confirmed that vaccination is found to be the most effective way to prevent the spread of influenza infection. Due to the reason of constantly changing in the strains of the influenza viruses, the update of seasonal influenza vaccines is needed yearly (Webster, Monto, Braciale & Lamb 2013; ECDC 2020) and over time the persons immune protection from vaccination decline (CDC 2020). It has said that after vaccination, it takes about two weeks for the development of antibodies to provide protection against influenza virus infection (CDC 2020).

Although World Health Organization (WHO) has recommended influenza vaccination to all healthcare workers, the rate of vaccinated healthcare is far below than the average rate especially in the European countries. The aim of this study is to help in increasing the vaccinated rate among healthcare workers by exploring their adherence to vaccination and finding the interventions to motivate healthcare workers for influenza vaccination. An integrative literature review has chosen as a method to get deep knowledge and find the answers to the research questions.

2 Influenza and Influenza vaccination

2.1 Influenza

WHO has estimated that annual epidemic influenza causes three to five million cases of severe illness and about 290000 to 650000 respiratory deaths. Seasonal epidemic of influenza occurs mainly during the winter in temperate climate but in the tropical regions it may occur throughout the year. Incubation period of influenza virus ranges from one to four days. (WHO 2020.)

The symptoms of influenza start with the sudden rise in body temperature along headache, muscle pain and malaise. On addition to that some may have cough usually dry, sore throat, runny nose, children can have stomach upset too. (Terveyden ja hyvinvoinnin laitos 2020; WHO 2020.) Any healthy individual of any age group can get influenza infection. Normally, people who are infected with influenza can recover within few days to less than two weeks, but it might develop other complications like sinus and ear infection to pneumonia, myocarditis and encephalitis in some people. Especially people of high risk of having influenza including people older than 65 ages, children less than five years, pregnant women, people with chronic medical conditions such as asthma, diabetes, heart diseases and healthcare workers can develop serious complication due to influenza. (CDC 2020; WHO 2020.)

Types of influenza

Influenza is a negative single-stranded RNA, enveloped, segmented virus which belongs to Orthomyxovirus family. (Webster, Monto, Braciale & Lamb 2013; CDC 2020). Depending on the immunologic and biologic properties, influenza viruses are divided into different types. Influenza A and B virions contain eight vRNA segments whereas influenza C virus contains seven vRNA segments. All three existed types of influenza virions have three subviral components: envelope, matrix layer underneath the lipid bilayers, and RNP core. (Webster et al. 2013, 37.) These three different types of influenza viruses are affecting human beings: Influenza A, Influenza B and Influenza C. In terms of surface antigens hemagglutinin (HA) and neuraminidase (NA), influenza A has 18 different H subtypes and 11 different N subtypes, among them in human it has been detected 8 H subtypes (H1, H2, H3, H5, H6, H7, H9, H10) and 6 N subtypes (N1, N2, N6, N7, N8, N9) Similarly, Influenza B has divided into two subtypes B Yamagata and B Victoria. Influenza B has affected mainly children. Since Influenza C has been rarely reported as a cause of human illness, therefore it has not been associated with epidemic disease. (Webster et al. 2013; CDC 2020.)

Pandemic influenza

In an ancient time, Influenza has first described by Hippocrates in 412 BC as an acute respiratory disease. It has said that the influenza viruses were occurred at irregular intervals varying in their severity and affecting mainly the elderly ones. (Webster et al. 2013, 20.) In history, it is said that influenza pandemic occurred in year 1889 and 1918, but the actual documentation of year 1889 influenza pandemic has not been identified. It has estimated that the death caused 1918 influenza pandemic also called as “Spanish flu” was above 50 million worldwide. (Webster et al. 2013; WHO 2018.)

Another major outbreak of influenza was reported in Hong Kong in year 1957 and eleven years later, in 1968 outbreak of influenza occurred in China. Since 1968, two types of viruses A (H3N2) and Influenza B has been circulating worldwide. In year 1976, the agent, A/New Jersey 76, was determined as an A (H1N1) virus of swine origin. In year 1997, an outbreak has occurred due to a highly pathogenic avian virus A(H5N1) causing 18 infected and 6 death in Hong Kong which was a result of transmission of viruses from poultry to humans. In 2009, a novel influenza virus A (H1N1) was first detected in Mexico and spread across the world causing influenza H1N1 pandemic. CDC has estimated that 151,700-575,400 people were died worldwide during the 2009 H1N1 pandemic. (Webster et al. 2013; CDC 2019; WHO 2018.)

Influenza viruses are continuously changing year by year due to the changes in the virus surface antigens hemagglutinin and neuraminidase. In the form of antigenic shift and antigenic drift, the changes in influenza viruses occur. (CDC 2020.) In antigenic drift, the mutation occurs resulting the novel strain while in antigenic shift, major change in one or both surface antigens occur due to the genetic recombination. Due to the reason of antigenic drift of influenza, the annual review and update of the composition of influenza vaccines is needed. It is also the reason of getting influenza more than once because of antigenic drift. Antigenic drift take place in all influenza types A, B and C while antigenic shift mainly appears in Influenza A which may result in a pandemic. (CDC 2021.)

2.2 Influenza Vaccination

Two types of vaccination inactivated influenza vaccines (IIVs) and live -attenuated vaccines (LAIVs) are developed. IIVs are made of killed influenza viruses containing either the whole inactivated viruses or viruses disrupted by detergents or solvents or purified hemagglutinin and neuraminidase. LAIVs are made from weakened influenza viruses. The production of IIVs and LAIVs uses either egg-based or cell-based, most of them produced by egg-based process. Cell-based influenza vaccines production does not require chicken eggs since the required virus are grown in animal cells. (Poland 2018, 89-90.)

The first live -attenuated influenza vaccine was developed against A/PR8 (H1N1) in 1936 Russia. Then, the first influenza B-virus-B/Lee was discovered in 1940. Similarly, in 1942 a bivalent vaccine against both A/PR8 and B/Lee was developed in USA which was the first inactive influenza vaccine. The need of trivalent influenza vaccines was recognized following the identification of H2N2 virus in 1958. Based on the global surveillance, from the year 1973, World Health Organization has issued recommendations annually for the compositions of seasonal influenza vaccination. Two recommendations have been issued separately from WHO since 1992 for northern and southern hemisphere. WHO has recommended trivalent composition with two strains of influenza H1N1, H3N2 and one strain of influenza B, either B/Victoria or B/Yamagata lineage until the year 2012. Due to the recognition of poor predictability of influenza B circulation WHO has recommended quadrivalent influenza vaccine composition annually since year 2013. (Poland 2018, 89-90.)

In 2020 during the COVID-19 pandemic, World Health Organization has recommended influenza vaccination for healthcare workers as a highest priority. For the Influenza season of 2020-2021 World Health Organization has recommended trivalent influenza vaccine in northern hemisphere. In Finland Vaxigrip® Tetra has designed by Finnish Institute of health and welfare (Terveyden ja hyvinvoinnin laitos) for the year 2020-2021 and mentioned that it is suitable for all the age groups above six months. Fluenz Tetra® vaccine has also recommended for the children aged between 2 to 6 years which can be administered as a nasal spray (Fimea 2020).

Healthcare workers and Influenza vaccination

Influenza vaccine do not cause flu rather it kills or weakens the viruses (CDC 2020). Health care professionals should be aware of infection control and prevention during the care of patient's, standard precautions should be followed by every health care professional in order to prevent the transmission of infectious diseases (CDC 2020). According to the survey done by Centers for Disease Control and Prevention (2020), it shows the increasing rate of vaccination against influenza among healthcare workers in United States of America. In United States 2019-2020, 80.6% of healthcare professional has got vaccinated against influenza. It has also mentioned that the vaccination coverage was highest among the healthcare professionals working in hospital setting. (CDC 2020.) Among the healthcare professionals, number of physicians was highest 98 % in getting vaccinated, nurses covered the second range 92%. Likewise, the lowest number were reported among assistances 72.4 % and non-clinical health care personnel which was 76.7%. (CDC 2020). In United states, according to Centers of Disease Control and Prevention (2020), the highest number of influenza vaccine has been distributed in 2020.

During the influenza season, there is a higher chance of transferring the influenza viruses to healthcare workers from the patients and vice-versa. As per the nature of healthcare workers, there is a potential of transmit influenza viruses to other high-risk populations such as long stay patients in hospitals and elderly in nursing homes (Poland 2018, 98). According to World Health Organization (2020), healthcare workers those working in clinical settings and emergency department are at more risk to exposed to influenza viruses. During the influenza outbreak, 10-59% of healthcare workers caring for influenza patients being infected with influenza virus (WHO 2020).

Vaccination against influenza among healthcare workers helps to protect their patients, families and colleagues hence encouraging healthcare workers to get vaccinated is equally important. Although the World Health Organization has recommended influenza vaccinations to healthcare workers, the statistics show the number of healthcare workers vaccinated is still low. Statistics from European Health Information Gateway, 2019 (Table 1) showed that in most of the European countries the rate of vaccinated healthcare workers is below the average. In some countries like Germany and Ireland, the rate is in increasing while observing the rate from year 2011 to 2019 but the data showed that still half of the total healthcare workers are unvaccinated. In case of Italy and Spain, the rate of vaccinated healthcare workers remains constant for latest years. In Nordic countries, the Norway has only 34.2% in year 2019.

Country	2019	2018	2017	2016	2015	2014	2013	2012	2011
Albania	65%	65%	66%	69%	47%	77%	NA	NA	NA
Belgium	35.4%	NA	NA	NA	NA	NA	NA	NA	NA
Croatia	35%	35%	20.3%	15.6%	11.5%	15.5%	16.4%	19%	31.2%
Estonia	48.4%	48.4%	NA	NA	25.7	NA	NA	NA	NA
Germany	52%	52%	40.4%	41.8%	39.8%	NA	NA	NA	NA
Hungary	29.6%	29.6%	32.4%	26.7%	NA	30.7%	38.7%	29.2%	34.3%
Ireland	49.6%	49.6%	41.8%	32.7%	25.1%	23.8%	24.1%	28%	18%
Italy	26.3%	NA	26.3%	15.6%	15.1%	NA	NA	NA	NA
Lithuania	25.1%	25.1%	29.3%	26.7%	27.4%	26.6%	25.9%	24.9%	24%
Norway	34.2%	34.2%	27.5%	17.1%	12%	8.9%	12.7%	NA	12%
Portugal	31%	31%	31%	29%	28%	28%	29%	28%	32%
Slovenia	13.7%	13.7%	14.3%	10%	9.4%	9.7%	11%	12.7%	15.7%
Spain	35%	35%	31.7%	26.1%	31.1%	27.5%	27.6%	22.9%	24.7%
Switzerland	20%	NA	20%	NA	NA	18%	17%	NA	NA
Ukraine	9.8%	9.8%	15.8%	10.3%	13.6%	33.3%	55.4%	61.7%	NA
UK (N. Ireland)	39.5%	39.5%	33.4%	29%	24.6%	24%	20%	20.4%	20.8%

NA = data not available

Table 1: Influenza vaccination coverage among healthcare workers (European health information Gateway 2019)

3 Aim and purpose

The main aim of this study was to search the evidence to encourage the healthcare workers for influenza vaccination.

The objective of this study was to explore the adherence of healthcare workers to immunization measures and to find the interventions to promote the influenza vaccination among healthcare workers.

Research questions:

- What is the adherence of healthcare workers to immunization measures?
- What are the motivating factors to encourage the healthcare workers to get vaccinated?

P (Population)	Healthcare workers
I (Intervention)	Vaccination
C (Context)	Healthcare facilities
O (Outcome)	Increase in vaccination rate

Table 2: PICO model

The research question or objective need to be clearly focused on a study (Coughlan & Cronin 2017, 33), and the questions chosen for the study are researchable. Here, in this study PICO model has applied where P represents the population of healthcare workers, Intervention would be Influenza vaccination among the healthcare workers, C is chosen as a context of healthcare facilities and O is aiming to increase the rate of vaccination among healthcare workers.

4 Materials and methods

4.1 Integrative literature review

Integrative literature is a part of theoretical research method. Integrative literature review is a method to summarize the theoretical literature to deliver a complete understanding of a particular subject or a problem. (Whittemore & Knafl 2005, 546.) Literature review is also called a process which involves systematically gathering, appraising and summarizing studies

relevant to the problem (Coughlan & Cronin 2017, 5). In today's healthcare the importance of evidence-based practice is growing and the need of literature review with evidence-based practice is equally demanded. All the available evidence in any given topics is reviewed and retrieved in literature, hence it helps to achieve the overall picture of the topic to provide an up to date care. (Aveyard 2019, 4.) Literature review also helps finding the traditional and current controversies as well as limitation and gaps in the field of the study (William & Whittaker 2020, 36).

Integrative reviews allow all the experimental and non-experimental research hence also called as the broadest type of literature review in compare to the systematic and meta-analysis literature reviews. Since the purpose of conducting an integrative literature review is large and the inclusions of research is board, the chances of arising the error and systematic bias may equally increase. (Whittemore & Knafl 2005, 547-548.)

According to Whittemore (2005), integrative literature review can be completed in five different stages problem identification, literature search stage, data evaluation, data analysis and presentation. The foremost stage in integrative literature review is to figure out the clear identification of the problem which is going to reviewed. In literature review, the extraction of data from primary sources is very necessary in order to get the accuracy of the research purpose. Hence, in the integrative literature review a clear problem identification is elemental. (Whittemore & Knafl 2005, 548.)

In order to produce an accurate result, searching process of literature review is critical. Literature can be searched from different databases according to the need and interest of the chosen topic. It might be challenging to find the relevant literature and can cause a bias in the results if the searching process is performed in inadequate databases. (Whittemore & Knafl 2005, 548.) Therefore, in an integrative literature review, to minimize the error and bias, search items, the database used, the inclusion and exclusion criteria should be clearly mentioned. Literature searching process should be rigorous and the results of the searches must be clearly outlined. (Coughlan & Cronin 2017, 15-17.) To evaluate the adequacy of the database, clearly stated sampling methodology should be acknowledged (Whittemore & Knafl 2005, 549).

In data evaluation stage of an integrative literature view, evaluating of the quality of primary sources is difficult since there is not any gold standard exist for the calculating process (Whittemore & Knafl 2005, 549-550).

In data analysis stage of integrative literature review, a thorough and unbiased interpretation of primary sources and an innovative synthesis of the evidence are the areas to be taken in account. This part of literature review is also a most difficult and challenging for the research where a potential error might occur. In data analysis process, data reduction, data

display, data comparison, conclusion drawing, and verification are included. (Whittemore & Knafl 2005, 550.)

Presentation phase includes the conclusion part of the integrative literature review. The results of the integrative literature reviews should be presented in logical way so that it helps the reader to understand the review. (Whittemore & Knafl 2005, 552.)

4.2 Inclusion and Exclusion Criteria

The inclusion and exclusion process in integrative literature review provide a fundamental information about the scope and significance of the review. In addition to this, inclusion and exclusion criteria helps to develop a strategy for searching for the literature that is related to the research problem. Inclusion and exclusion criteria are also a combination of limits needed for the review rather than the researchers own convenience. (Aveyard 2019, 77-79.)

In an integrative literature review, to prevent the problems associated with the incomplete searching and selection bias, the data searching should be rigorous with the inclusion and exclusion criteria (Coughlan & Cronin 2017, 15). Before the data search, inclusion and exclusion criteria were well defined. Studies related with Influenza vaccination and healthcare care workers were included. Studies carried out between year 2011 and 2020 were included in the study. The studies which were carried out in English languages were accepted for the study. Peer reviewed studies with all study designs were included. In order to receive the high quality, grey literature was omitted. The inclusion and exclusion criteria have shown in the table 2.

Inclusion Criteria	Exclusion Criteria
Studies done in English language	Studies done in other languages than English
Studies published between year 2011 and 2020	Studies published before year 2011
Studies with abstract and full text	
Peer reviewed original academic studies	Textbooks, pro-gradu thesis
Studies related with influenza vaccination and healthcare workers	Studies which do not related with influenza vaccination and healthcare workers

Table 2: Inclusion and Exclusion criteria

The topic for the study was chosen in November 2020 and on 4th December the topic presentation was carried out. After the approval of the topic from the supervisor, thesis planning was performed on mid of January 2021. Due to the working schedule of the author the data collection was performed slightly later than the actual plan, but the author was

practicing data searching in between with the guidance of information technologists from Laurea University of Applied Sciences, data collection was conducted finally on early April, followed by data evaluation and analysis in April-May 2021. The final report of the thesis was presented on 2nd June 2021. The study phages have shown in Table 3

Study phages	Timeframe
Planning phage Study subject and topic has chosen and topic presentation. Study plan presentation	November-December 2020 January 2021
Implementation phage Data collection Data Evaluation Data analysis	April 2021 April-May 2021 May 2021
Final phage Study presentation Publication of study	June 2021 June 2021

Table 3: Study process

4.3 Data search and review process

Data searching process should be thorough and to calculate the adequacy of the databases, the clearly sampling methodology is very important (Coughlan & Cronin 2017, 15; Whittemore & Knafl 2005, 549). The data for this study search was performed in April 2021. Before carrying out the data search process, author had an online meeting twice with information technologist and librarian of Laurea University of applied Science. After the guidance and suggestions of the expert's author has chosen four different electronic databases CINAHL with full text (EBSCO), ProQuest central, Science Direct (Elsevier) and PubMed. All the data were then stored in RefWorks software. The data bases and search terms used in data search process has given in Figure 1

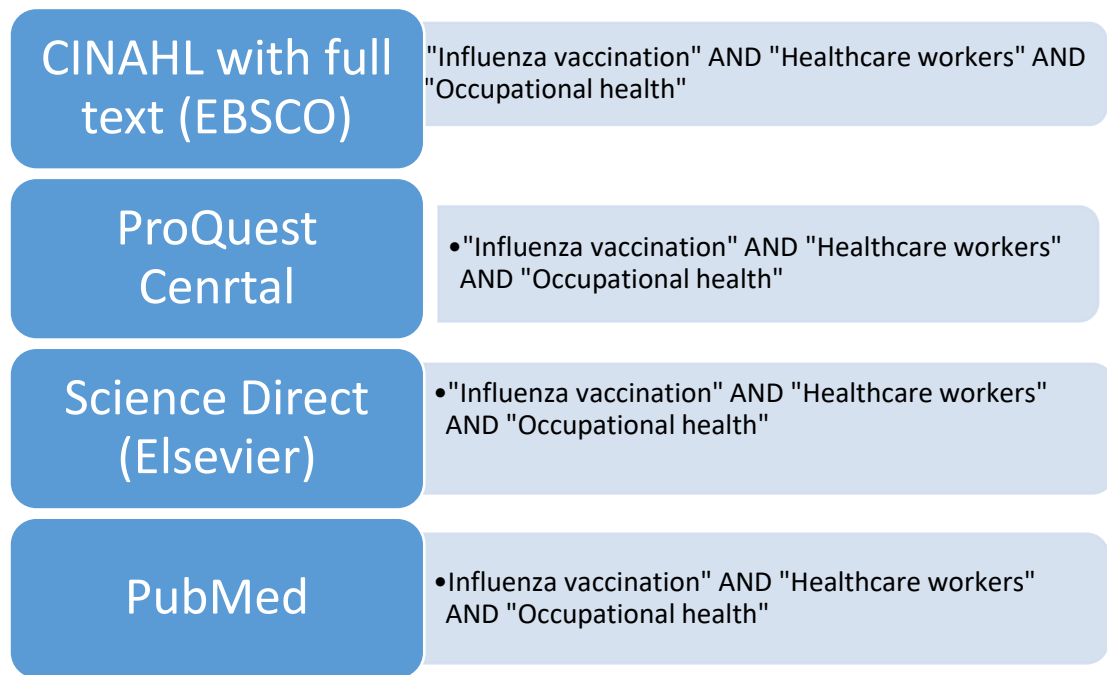


Figure 1: Data searching process

During the data searching process, total 250 studies were identified from four different mentioned databases. All the data were first stored in RefWorks software. Then all the duplicate data were removed. After removal of duplication 223 studies were selected for screening the title. After the title and abstract screening 188 studies were removed and remaining 35 studies were proceeded for full-text screening. Total 35 full text studies were assessed, among those 6 articles were removed for the reason of not describing the influenza vaccination among healthcare workers. Remaining 29 articles were further carefully assessed for inclusion and exclusion criteria. Total sixteen articles were finally selected for this study, among them ten were observational studies, four were systematic reviews and two were qualitative studies. All the studies were done after 2010. Among them six studies were conducted in between 2011 and 2015, similarly ten studies were done between year 2016 and 2019. The setting of the studies was done mostly in European countries and America. In total, studies done in Italy (n= 5), Spain (n=3), United States of America (n=3), United Kingdom (n=2), Belgium (n=2) and Canada (n=1). No studies were found from Finland. The data reviewing process has shown in Figure 2.

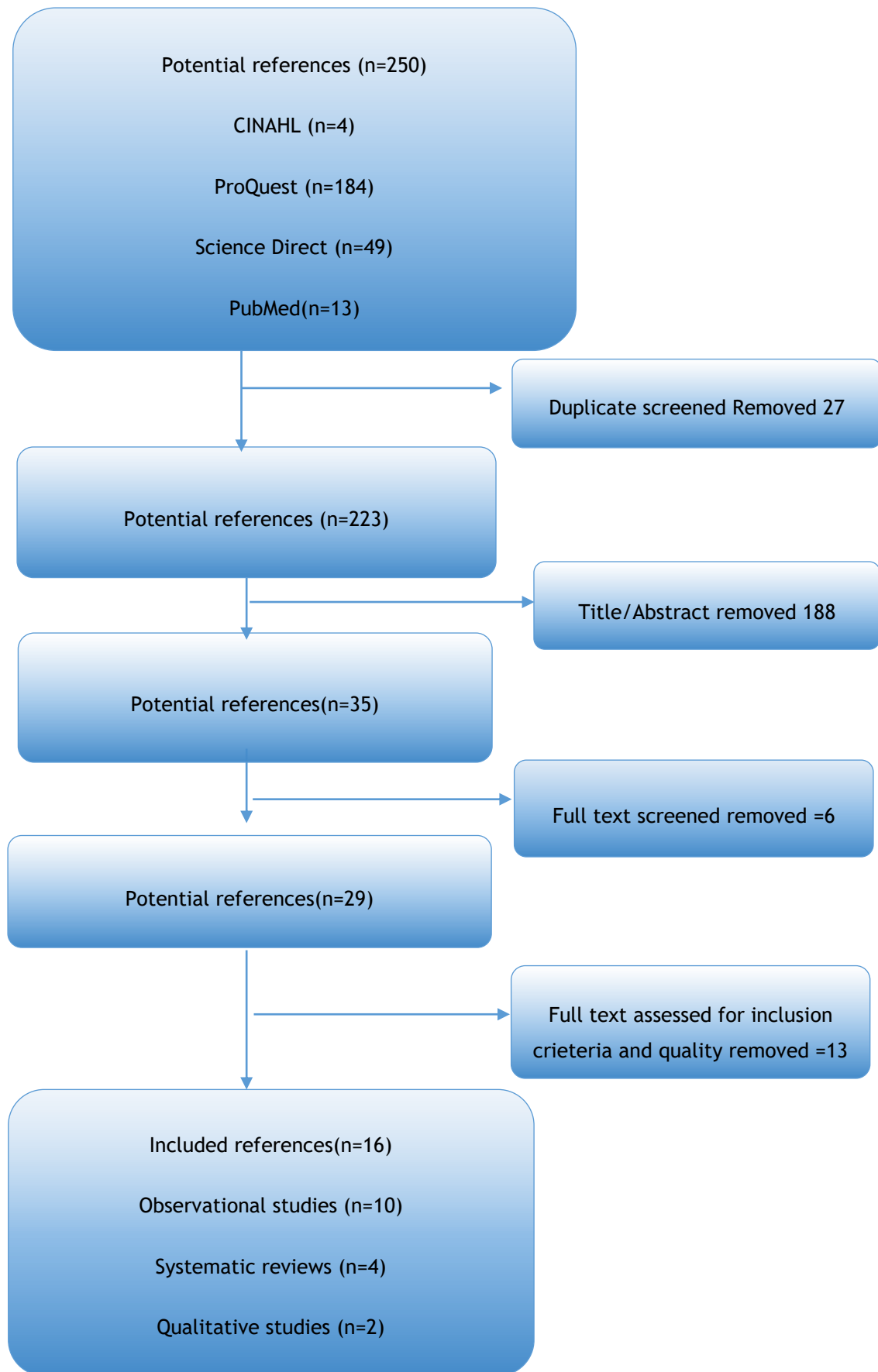


Figure 1: Data review process

4.4 Quality assessment

The assessment of quality in integrative literature is complex due to the inclusion of wide ranges of studies (Whittemore & Knafl 2005, 550). The quality of the included studies was carefully assessed by using the design specific quality assessment tools. Since most of the medical studies are observational. Strengthening the Reporting of Observational Studies in Epidemiology has developed to report the quality of observational studies (Vandernbroucke et al. 2007). STROBE is mainly used as a quality assessment tools for observational studies: cohort, case-control, and cross-sectional studies (STROBE 2009). Ten studies out of sixteen total reviewed studies were observational. The quality assessment of observational studies has shown in Appendix 3.

Critical Appraisal Skills Programme has designed a checklist for the quality assessment of qualitative research articles (CASP 2020). To assess the quality of qualitative studies CASP has used. Two studies out of sixteen were qualitative studies. The quality assessment of qualitative studies has shown in Appendix 4.

PRISMA tool (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) helps in improvement of the reporting of systematic reviews and meta-analyses (PRISMA 2015). PRISMA was used to assess the quality of systematic literature reviews. Out of the sixteen studies, four studies were systematic literature review. The quality assessment of systematic literature review has shown in Appendix 5.

Quality assessment of the studies has done in terms of scoring. In order to make it easier for the comparison of the studies, percentage was added with the scoring. Among the reviewed observational studies (n=10) the quality of the studies ranges from 59%-95% mean 80.6%. The quality of qualitative studies (n=2) where one has score of 95% and other studies has 55%. The quality of systemic reviews (n=4) ranges from 52% to 77% with the mean of 65%. The quality assessment of all the reviewed studies has given in appendixes separately according to the method of the studies observational, qualitative and systematic.

4.5 Data analysis

In data analysis process, a thorough and unbiased interpretation of primary sources need to be displayed transparently with an innovative synthesis of the evidence (Whittemore & Knafl 2005, 550). In the data analysis process, all the 16 studies were read repeatedly and thoroughly. The contents of all the 16 studies are displayed in Appendix 2. The data were extracted from the original articles according to the research questions. The studies were

repeatedly read and read to get the answers for the research questions. The extracted data were coded and categorized as sub-themes. Main themes were chosen according to the research question. Adherence to vaccination and interventions to the vaccination. The final results extracted according to the questions is shown in Table 4. More details of codes, sub themes and themes were attached in Appendix 1.

Adherence to vaccination among healthcare workers	Interventions to promote vaccination among healthcare workers
<p>Factors influencing adherence to vaccination.</p> <ul style="list-style-type: none"> • Demographic factors • Knowledge about influenza and vaccination • Positive believe towards vaccination. <p>Factors affecting adherence to vaccination.</p> <ul style="list-style-type: none"> • False believe about influenza and vaccination • Fear and doubt related to vaccination. • Lack of access to vaccination 	<ul style="list-style-type: none"> • Encouragement • Educational programme • Communication • Access to vaccination • Mandatory Vaccination

Table 4: Summary of the findings

5 Results

5.1 Adherence to influenza vaccination among healthcare workers

5.1.1 Factors influencing adherence to influenza vaccination

Demographic factors

Different demographic factors were emerged related to the adherence to influenza vaccination among healthcare workers. Out of 16 studies, four studies mentioned the age of healthcare workers. (Boey et al. 2018; Bonfiglioli, Vigoli, Guglielmi, Depolo & Violante 2013; Castilla et al. 2013; Dini, Toletone, Sticchi, Orsi, Bragazzi & Durando 2018; Kraut, Graff & McLean 2011). The higher rate of vaccination showed in the age group above 35 years old healthcare workers (Castilla et al. 2013). Age of healthcare workers not only influence in taking the vaccination but also in the continuity of vaccination (Castilla et al. 2013; Kraut et al.2011).

Studies also pointed out that the gender of healthcare workers is also associated with the uptake of vaccination, male gender were more likely to get vaccinated and were continuing

the influenza vaccination yearly (Boey et al. 2018; Dini et al. 2018; Squeri et al. 2017). Physicians have the higher rate of vaccination (Boey et al. 2018; Rodríguez-Fernández et al. 2016; del Campo, Villamor, Cáceres, Gómez, Ledesma & Mahillo-Fernández 2011). In the study completed by Boey et al. (2018), indicates that the number of vaccinated physicians is higher in hospitals in comparison to nurses and other healthcare workers while in nursing homes the number of vaccinated nurses showed higher than other healthcare workers such as nursing assistants.

Influenza vaccination uptake among healthcare workers is associated with the healthcare workers health status. Healthcare workers who are having chronic illness are more likely to take influenza vaccination (Boey et al. 2018; Castilla et al. 2013; Lorenc, Marshall, Wright, Sutcliffe & Sowden 2017.) In the study done by Boey et al. (2018), among the vaccinated healthcare workers 7.3% in hospitals and 9.8 % nursing homes were having chronic illness.

Knowledge about influenza and vaccination

Knowledge about the influenza and influenza vaccination has found to be the most influence reason to adherence to vaccination. Majority of studies have mentioned that the knowledge regarding the influenza and influenza vaccination among healthcare workers in terms of vaccination uptake. To protect themselves, family members and patients was mentioned to be the most important factor in up taking the vaccination (Boey et al. 2018; Bonfiglioli et al. 2013; Dini et al. 2018; Kraut, Graff & McLean 2011; Rodríguez-Fernández et al. 2016). In the study performed by Lorenc et al. (2017), some healthcare workers mentioned that the reason of getting vaccinated was to protect the vulnerable group like older aged and immune-compromised patients. In a Systematic literature review completed by Dini et al. (2018), among the healthcare workers, it showed that the medical doctors have the higher knowledge about the influenza and vaccination, but the knowledge has found to be limited in dentists.

Positive believe

Belief towards the infection and vaccination uptake has discussed in many studies. Vaccinated healthcare workers have positive belief towards the effectiveness of vaccination (Boey et al. 2018; Dini et al. 2018; Hakim, Gaur & McCullers 2011; Lorenc et al. 2017). For the reason of getting infected from the workplaces also driven the healthcare workers to get vaccinated (Castilla et al. 2013). In addition to that, the believing in the reducing of influenza infection also influence the healthcare workers to get vaccinated (Lorenc et al. 2017). Studies done by Kraut et al. (2011), has shown that the confidence with pandemic influenza was more than the seasonal vaccination and healthcare workers were taken pandemic influenza as a serious illness.

5.1.2 Factors affecting adherence to influenza vaccination

False believe about influenza and vaccination

Most of the studies have mentioned the reason of negative believe of unvaccinated healthcare workers towards the influenza vaccination. Unvaccinated healthcare workers did not take seriously neither illness nor vaccination (Boey et al. 2018; Riccò, Cattani, Casagranda, Gualerzi & Signorelli 2017). Healthcare workers believed that they have good immunity system since they are already exposed to infection (Lorenc et al. 2017). In the same study done by Lorenc et al. (2017), some healthcare workers have mentioned that the infection of influenza is more likely to get from sick patients but not from the healthcare workers while other believed that healthcare workers do not need any vaccination since they are healthy adults (Squeri et al. 2017). Some healthcare workers confuse influenza with common cold so the reason not taking as serious and others believing that only having chronic diseases need to get vaccinated (Lorenc et al. 2017).

Believing that already having a healthy immunity and weakening the immune system after the vaccination were another reason of healthcare worker not to get vaccinated to influenza vaccination (Boey et al. 2013; Hakim et al. 2011). In the systematic literature review performed by Lorenc et al. (2017), some participants pointed that the ineffectiveness of vaccination in a sense of mutation of the virus and the possible mismatch of the strains.

Fear and doubt related to vaccination

Fear of getting side effects from the influenza vaccination is the common factor mentioned by the healthcare workers in most of the studies (Boey et al. 2018; Bonfiglioli et al. 2013; Hakim et al. 2011; Kraut et al. 2011; Lorenc et al. 2017, Riccò et al. 2017; Rodríguez-Fernández et al. 2016; Squeri et al. 2017). In the study completed by Lorenc et al. (2017) shows that the fear of getting influenza and influenza like illness from the received vaccination among some healthcare workers. In addition to side effects, concern about the efficiency of the vaccination has mentioned in the studies. (Boey et al. 2018; Kraut et al. 2011; Lorenc et al. 2017; Rodríguez-Fernández et al. 2016; Squeri et al. 2017). The lack of sufficient scientific evidence to prove the effectiveness of vaccination results in the doubt among the healthcare workers (Lorenc et al. 2017).

Lack of access to vaccination

Some of the studies has mentioned that the lack of access of vaccination was the reason that healthcare workers not receiving influenza the vaccination. The rate of vaccination in healthcare workers decreases due to the unavailability of vaccination for the healthcare workers (Dini et al. 2017; Rodríguez-Fernández et al. 2016; Tognetto et al. 2020). The barrier

to vaccination is the ease to access to vaccination service as well as the infrastructure of the hospitals (Tognetto et al. 2020).

5.2 Interventions to promote vaccination among healthcare workers

5.2.1 Encouragement

Motivation of healthcare workers to vaccination is important in order to achieve the higher vaccination rate. Studies completed by Boey et al. (2018) and Kraut et al. (2011) has shown that the encouragement from the supervisor helped staff to get vaccinated. Closed contact persons, family members and colleagues are the other sources of motivation to get vaccinated (Boey et al. 2018). Healthcare workers are influenced from peers and colleagues either in favor of vaccination or against the vaccination (Lorenc et al. 2017). Rewarding the vaccinated healthcare workers either individually or in a group also found to effective in motivating to vaccination (Boey et al. 2018; Rashid, Yin, Ward, King, Seale & Booy 2016; Stead, Critchlow, Patel, MacKintosh & Sullivan 2019). Offering vouchers for foods and drinks also dragged healthcare workers to the vaccination place (Stead et al.2019). Lead advocate and role model also help in motivating the staff for vaccination uptake (Rashid et al. 2016).

5.2.2 Educational programme

Studies have pointed out the education regarding the infection and vaccination be the most effective intervention to increase the rate of vaccination among healthcare workers. Vaccination campaign increases the rate of vaccination among healthcare workers beside this continuing medical education for healthcare workers is another needed (del Campo et al. 2011; Tognetto et al. 2020.)

Occupational health surveillance programme is another long-term intervention for the better result of vaccination among healthcare workers (Dini et al. 2018). Education presentations, videos and peer vaccinators may get success for motivating the healthcare workers (Kraut et al. 2011). Study completed by Rashid et al. (2016) has figured out that not only the education has seen to be effective in increasing the vaccination rate among healthcare workers, but the combination of other intervention in addition with education campaign showed the best results.

5.2.3 Communication

Communication with the healthcare workers is another intervention to increase the vaccination rate among healthcare workers (Boey et al. 2018; Kraut et al. 2011; Lindley et al. 2014; Stead et al .2019). Sending emails and reminders of vaccinations helps increased the rate of vaccination among healthcare workers (Lindley, Dube, Kalayil, Kim, Paiva & Raymond 2014; Rashid et al. 2016). Availability of the information in the websites (Lindley et al. 2014)

as well as the informational posters hanging on the working places (Tognetto et al. 2020) also drain the concentration of healthcare workers. Direct communication including meetings, group interaction, seminars, conference calls between health staffs and facilities came to be effective according to the studies completed by Lindley et al. (2014) and Stead et al. (2019)

5.2.4 Access to vaccination

Vaccination among healthcare workers is very important. In order to increase the rate of vaccination in healthcare worker, it is equally important to have access to vaccination. In the Study completed by Tognetto et al. (2020), it has showed that after implementing the intervention of access to vaccination, the rate of vaccinated healthcare workers has increased showing the importance of location of the vaccination site. Easy access to vaccination site, availability of vaccination and free access to vaccination promote the rate of vaccination among the healthcare workers (Rashid et al. 2016; Rodríguez-Fernández et al. 2016; Squeri et al. 2017; Stead et al. 2019; Tognetto et al. 2020).

5.2.5 Mandatory vaccination

In a systematic literature review performed by Lorenc et al. (2017), many controversies about the policy have discussed, some healthcare workers taken as a demand of patient protection, while other others reported as a freedom of choices as a citizen. In the study done by Van Hooste & Bekaert (2019), it has mentioned that the mandatory vaccination has increased the vaccination rate but not found any clinical outcomes. Similarly, Study done by Hakim et al. (2011), in children hospital USA, the healthcare workers were asked about the mandating vaccination policy where 36.6% of healthcare workers opposed the mandating influenza vaccination. Freedom of choice and autonomy were given the main reason of opposing the mandating policy for influenza vaccination. (Hakim et al. 2011.)

According to the study done by Van Hooste & Bekaert (2019), it has mentioned that the mandatory vaccination has proven to work in USA but at the time it has caused the conflict situation and causes disruptions in medical ethics for healthcare workers. Study have showed that to prevent one death from influenza, 6000-32000 of healthcare workers should have receive the vaccination of influenza. In order to prove the effectiveness of vaccination in healthcare workers there is still a lack sufficient evidence has exists. (Van Hooste & Bekaert 2019.)

6 Discussion

The main objective of this study was to explore the adherence to influenza vaccination among healthcare workers and to find the interventions to motivate the healthcare workers for influenza vaccination. WHO has recommended influenza vaccination for every healthcare workers considering the high-risk categories. Healthcare workers are equally in risk of getting infection and transmission of infection. While reviewing the articles, many influencing and affecting factors to adherence to vaccination have emerged. Healthcare workers of older aged seem to have more positive believe towards the vaccination in comparison to the younger aged healthcare workers. In few articles' male healthcare workers at in higher number of getting vaccinated and continuing the vaccination. Healthcare having likewise chronic illness were more influenced to get vaccination against influenza.

Healthcare workers who have knowledge related to influenza infection and the seriousness of illness caused by influenza have shown the positive perception towards the vaccination and likely to encouraged colleagues to get vaccinated. Medical doctors have seen to have greater knowledge about infection and vaccination. Healthcare workers who have enough knowledge about vaccination were aware of possible side effects caused by vaccination like fever, pain and redness in injection site. The Protection of themselves and family protection were found to be the common reason of getting vaccinated by healthcare workers in most of the studies. In some studies, it has shown that the healthcare workers were of more confidence about the pandemic influenza rather than seasonal. The number of vaccinated healthcare workers were higher for pH1N1 vaccination than seasonal in a study done by Kraut et al. (2011) but in another study done by del Campo et al. (2011), the vaccination rate for pandemic influenza has shown frequently less than seasonal. Some healthcare workers were not taken seasonal as serious rather they were confused with common cold while other assumed themselves as healthy individual with good immunity system. Some healthcare workers also had a false believe of not getting infected from workplaces since they are already exposed to many other infections. (Lorence.et al. 2017.)

Fear of having complication after the vaccination were pointed out in many studies. Healthcare workers who were not vaccinated against influenza were reported of fear of getting influenza and influenza like illness and having adverse effects from the vaccination. Concerning about the effectiveness of vaccination was also factor affecting adherence to vaccination. Healthcare workers expressed their concern about the effectiveness of the vaccination showing the reason of possible mismatch of virus strains and continuous mutation of viruses. Lack of sufficient evidence of effectiveness of vaccination were shown to be another factor affecting the adherence of vaccination among healthcare workers. In addition to this lack of access to vaccination also affect in vaccination of healthcare workers.

Healthcare workers who were encouraged by supervisors, management and colleagues were likely to get vaccinated. The role of supervisor and management faculty in motivating the staffs to get vaccinated is seen effective. Continuous education programme in workplaces regarding the importance of infection control and benefits of vaccination not only motivate the healthcare workers also helps to raise the vaccinated number of healthcare workers. In order to increase the awareness of effectiveness of vaccination and risk of infection of influenza, the availability of prevalent information in intranet, distributing educational materials to the healthcare workers is needed. Communication with healthcare workers directly through seminars, interviews, discussion build confidence of healthcare workers in terms of acceptance of vaccination. Sending reminders messages for vaccination, newsletter through emails also promote the vaccination in healthcare workers. (Rashid et al. 2016.)

Awarding the vaccinated healthcare workers is appeared to be another intervention to promote the vaccination among healthcare workers. To motivate the healthcare workers distribution of prizes, vouchers, coupons, recognition for personal and group vaccination seemed to be effective (Rashid et al. 2016; Stead et al. 2019) Access to the vaccination also promote the vaccination. Onsite vaccination services, easily assessable vaccination site, free vaccination, flexible vaccination hours, mobile vaccination cart are other interventions to promote the vaccination among healthcare workers.

In United States of America mandatory vaccination has proven and hence increases influenza vaccination rate among healthcare workers. In many European countries the rate is still far below than the average. Many biases and controversies have been discussed in the study done by Van Hooste & Bekaert (2019). Promoting well-being of patients and not harming the patients are the ethical duties of healthcare workers. Employees need to be convinced to the effectiveness of vaccination but there is still a lack of sufficient evidence to prove that the vaccination of healthcare workers reduces mortality and morbidity in patients. (Van Hooste & Bekaert 2019). Some suggests the mandatory vaccination policy for the demand patient's protection while others want to follow the freedom of choice. (Lorenc et al. 2017.)

6.1 Limitation

In the inclusion criteria of the study, articles published in only in English language were included from year 2011-2020. This integrative literature review is the first attempt of the author hence the lack of experience in the field of evaluation and analysis might affect the outcomes of the study. The quality of all the reviewed articles were checked using the standard checking tools but again the level of experience of the author might differ the values of the study. According to the Whittemore (2005), the errors and bias can be occurred in any stage of the literature, hence the attention of quality is essential. The quality of all the reviewed articles were checked using the standard checking tools but again the level of

experience of the author might differ the value of the studies. Another limitation of this study is a single author, it is suggested to ensure the accuracy two independent authors reviews the codes (Whittemore 2005, 59), hence systematic bias and errors may arise in any phase of the studies selection, evaluation and analysis even though the work has done very carefully.

6.2 Ethical Consideration

This study has done as a part of authors master's studies in Laurea University of Applied Science. In all research ethical issues must be always considered. (Holloway & Wheeler 2011, 53). Since the study has done based on theoretical process, the legal consent for the study has not required. However, the author has followed the guidance and instructions from the information technologist and librarian during the data searches process and tried to do the best by practicing searching from different databases. To avoid the plagiarism references of the studies were included.

7 Conclusion

Since vaccination is the most preventable method for infectious diseases like influenza, the promote of vaccination is essential. Healthcare workers are at high risk in getting influenza and transmission the viruses. Studies showed that the fear and doubt about the effectiveness of vaccination has still exists among the healthcare workers. Interventions like educational programme, encouragement form supervisor and management, communication need to be actively implemented globally in order to motivate the healthcare workers to get vaccinated against influenza. Mandatory vaccination policy has proven to be the most effective way despite of some ethical reasons like freedom of choice.

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Appendix 1: Codes, sub-themes and themes.

Codes	Sub-themes	Themes
<p>-Male gender, Chronic diseases, Older aged healthcare workers</p> <p>High Education level, Awareness of vaccine safety</p> <p>Awareness of side effects, Protect against disease</p> <p>-Concern about the infection, Reduce absenteeism</p> <p>Believe in effectiveness of vaccination, Not getting sick after vaccination, Confidence of vaccination, Protection</p>	<p>Demographic factors</p> <p>Knowledge about infection and vaccination</p> <p>Positive believe</p>	<p>Factors influencing to adherence</p>
<p>Weakens the immunity, believe of having strong immunity system, believing only older people and with chronic illness get infected, influenza is not a serious disease, Patients get infected from other patients rather than HCW</p> <p>Vaccine is not effective, Fear of getting sick after vaccination, Fear of side effects, Lack of evidence, Mutation of viruses and possible mismatch of viruses,</p>	<p>False believe</p> <p>Fear and doubt</p>	<p>Factors affecting adherence to vaccination</p>

<p>lack of knowledge, Doubt of usefulness of vaccination, Not convinced about the efficiency of vaccination</p> <p>Lack of assess to vaccination, Access to vaccination site</p>	<p>Lack of access to vaccination</p>	
<p>Reward, Vouchers, Encouragement from supervisor, Encouragement from management Motivation from family members, friends' colleagues, Lead advocate, Role model</p> <p>Education, Peer vaccination, Video presentation, Vaccination campaign, educational presentations</p> <p>Emails, Reminders for vaccination, Information in website, Meeting, Seminar, Group interaction</p> <p>Easy access to vaccination, Free vaccination to healthcare workers, Availability of vaccination, Vaccination site</p> <p>Mandatory vaccination policy increases vaccination rate, Freedom of choice</p>	<p>Encouragement</p> <p>Educational Programme</p> <p>Communication</p> <p>Access to vaccination</p> <p>Mandatory Vaccination</p>	<p>Intervention to promote vaccination</p>

Appendix 2: Contents of included studies

References	Country	Aim and purpose of the study	Design/Study sample/ Data and Methods	Results/Conclusion	Quality assessment
Boey et al. 2018. Attitudes, beliefs, determinants and organizational barriers behind the low seasonal influenza vaccination uptake in healthcare workers	Belgium	To determine demographic factors which demotivated healthcare workers to receive influenza vaccination.	Observational Method Online survey was done in 5141 healthcare workers from 13 hospitals and 14 nursing homes of different size in Flanders. Fully completed questionnaire were used for data analysis	The mean vaccination coverage by participating healthcare institutions was 40.4% in the hospitals and 45,3% in nursing homes. Factors that positively influenced vaccination coverage are encouragement by supervisors. Factors that negatively affected vaccination coverage are misconception about influenza and its vaccine as well as underestimation of the risk of contracting influenza by patients and healthcare workers. Conclusion: Need of guidance for the organization of seasonal influenza campaigns in which education, communication and easily accessible vaccination are promoted.	42/44 =95 %
Bonfiglioli et al. 2013. Getting vaccinated or	Italy	To find out the reasons of getting vaccinated and	Observational Study	Healthcare workers who did not take any vaccination were of younger ages than those	40/44 = 91%

<p>not getting vaccinated? Different reasons for getting vaccinated against seasonal or pandemic influenza</p>		<p>not by healthcare workers.</p>	<p>Sample of 168 healthcare workers from university hospital in Italy between Dec 1 2010- 11 Jan 2011.</p> <p>Among them 31% doctors, 28,6% nurses, 9,5% nurse assistants and 31% performed health activities but not in contact with patients.</p> <p>Each HCW completed two questionnaires that measured the reasons why the worker decided whether or not to get vaccinated against seasonal influenza and the other that measured the reasons why the workers decided whether or not to get vaccinated against pandemic influenza.</p> <p>Three groups were formed for data analysis, both vaccines</p>	<p>who took both vaccinations.</p> <p>Healthcare workers who have awareness of vaccine safety and side effects for the pandemic influenza vaccine have got both vaccinations.</p> <p>The age and being well informed about vaccination topics are the most important variables in determining the choice to take the vaccine.</p> <p>Conclusion. The importance of education programs to improve awareness among healthcare workers concerning the benefits of taking the influenza vaccination, when particular attention paid to younger workers.</p>	
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			<p>(N=82, Group A), Seasonal only (N=33, Group B), no vaccine (N=53, Group C).</p> <p>Exploratory factor analysis, ANOVA and X2, Multinomial logistic regression analysis was used to analysis the data.</p>		
<p>Castilla et al. 2013. Trends in influenza vaccine coverage among primary healthcare workers in Spain, 2008- 2011</p>	Spain	<p>To describe the trends in seasonal influenza vaccination coverage in Primary healthcare workers in 2008 -2009 to 2010-2012 seasons including pre-pandemic, pandemic and post pandemic seasons.</p>	<p>Observational Study</p> <p>Survey was conducted in Primary healthcare workers of seven regions (Andalusia, the Basque Country, Castile and Leon, Cata- lonia, Madrid, Navarre and Valencia Community).</p> <p>Random sample of primary care centres was selected in order to reach approximately 600 PHCWs in each region.</p> <p>No of healthcare workers</p>	<p>Among the 5433 contacted healthcare workers, 2625 (48,3%) had responded to the survey, 47,0 % general practitioners, 10,3% pediatricians, and 42.7/ nurses.</p> <p>Their reported vaccination rates from season 2008-2009 to 2011-2012 decreased over time: 58,4%, 57.4% and 49,3% (linear trend, $p<0.001$). Among healthcare workers vaccinated in any previous season, 70,2% were vaccinated again in 2011-2012, compared with 5,2% among those not previously vaccinated ($p<0.001$). Continuity of vaccination increased with age, and with the workers or cohabitant having a major clinic condition. Vaccination was higher in workers who recognized vaccination as effective and</p>	36/44 = 82%

			<p>contacted were 5433.</p> <p>The survey consisted of three sets of questions.</p> <ul style="list-style-type: none"> -About influenza vaccination status -Attitude and perceptions about influenza vaccination -Sociodemographic and professional information. 	<p>those who worried about being infected or infected patients.</p> <p>Conclusion: Influenza vaccination coverage in primary health care workers has declined, especially after the pandemic. Intensive interventions are needed to change the trend. Knowledge of vaccination should be reinforced by stressing the effectiveness of the vaccine and the risks of influenza for healthcare workers and patients.</p>	
del Campo et al. 2011.	Spain	To analyse the influenza vaccination among healthcare workers following a vaccination strategy characterized by an increased effort to maximize the hospital vaccination rate.	<p>Retrospective observational study.</p> <p>Study has carried out in a tertiary hospital "The Fundación Jiménez Díaz" in Madrid based on the employee vaccination records of the hospital for seasonal influenza of 2008-2009 and 2009-2010.</p>	<p>2739 healthcare workers at a tertiary university hospital were evaluated for this study in terms of seasonal and pandemic influenza vaccination of year 2009-2010.</p> <p>The seasonal influenza vaccination rate was 26,7% (48,3% increase vs 2008-2009, p= 0.0000), and 14,8% in case of pandemic influenza. Healthcare workers with direct patient contact showed similar seasonal (25.7%) and</p>	32/44 = 73%

			<p>And also, the vaccinations for pandemic influenza in 2009-2010.</p>	<p>pandemic(15,4%) influenza vaccination rates compared to the overall rates.</p> <p>Physician vaccination displayed the highest rate, showing significant differences vs. total rate. (38,3%, p= 0.0007 for seasonal, and 32,2%, p= 0.0000 for pandemic influenza). The areas in which the vaccination strategy was most active reflected a significant increase 32.6%, p= 0.0056 for seasonal, and 25,2%, p= 0.0000 for pandemic influenza).</p> <p>Conclusion: The more active campaigns might increase influenza vaccination among healthcare workers.</p>	
<p>Dini et al. 2017. Influenza vaccination in HCW: A comprehensive critical appraisal of the literature</p>	Italy	<p>To study the effectiveness of interventions for improving influenza vaccine uptake among healthcare workers.</p>	<p>Systematic reviews of randomized controlled trail (RCTs)</p> <p>28 studies are selected from 27 different electronic databases for the study following the PRISMA guidelines.</p>	<p>Among 28 studies 12 systematic literature reviews, 13 meta-analysis, and 3 appraisals of published reviews were included in the study.</p> <p>Based on the main research questions, they have coded in 9 different topics:</p> <p>Epidemiology data, influenza related knowledge, attitude and beliefs among</p>	<p>34/48 = 71%</p>

			No time filter or language restrictions were applied.	<p>healthcare workers, influenza related risk perception among HCWs, adherence of HCWs to influenza vaccination, determinants of influenza vaccine uptake among HCWs, effects of influenza vaccination among HCWs on HCWs themselves, effects of influenza vaccination among HCWs on patients, strategies for improving influenza vaccine uptake among HCWs, economic impact of influenza vaccination among HCWs.</p> <p>Conclusion: High quality research would help in policy makers and stake holders to shape evidence-based initiatives and programme to optimize the prevention of influenza.</p>	
Hakim et al. 2011. Motivating factors for high rate of influenza vaccination among HCW	United States of America	To identify the factors that motivate healthcare workers to achieve and maintain seasonal influenza vaccination rates	<p>Cross -sectional observational study</p> <p>Electronic questionnaire has sent to the employees of St. Jude Children's Research Hospital between 30.07.2010 and 31.08.2010</p>	<p>2036 (63,1%) of the 3227 qualifying employees, including 879 (95,0%) of the 925 HCWs at SJCRH participated in the survey.</p> <p>93,8% and 75,2% of HCW reported receiving seasonal influenza and 2009 H1N1 influenza vaccines respectively in the year 2009-2010 season.</p>	37/44 = 84%

			<p>The respondents were classified as HCW or non -HCW based on the responses to the question “Does your job require you to come in contact with patients?”</p> <p>Demographics, prior receipt of influenza vaccines, reasons for acceptance or refusal of seasonal and 2009 H1N1 pandemic vaccine, attitudes on mandatory vaccination were assessed.</p>	<p>Benefits to self and patients were said as the most frequent reasons for accepting the seasonal (83,5% and 78,3% respectively) and 2009 H1N1 (85,9% and 81,1% respectively) vaccination.</p> <p>36,6% of HCWs opposed mandating influenza vaccination.</p> <p>Violation of freedom of choice and personal autonomy were the most frequently reported reasons for opposition.</p>	
<p>Kraut et al. 2011. Behavioral change with influenza vaccination: Factors influencing increased uptake of the pandemic H1N1 versus seasonal influenza vaccine in healthcare personnel</p>	Canada	To explore the reasons for pH1N1 vaccination among healthcare workers	<p>Observational study</p> <p>HCW who received pH1N1 vaccine (n= 2376) were invited to the online survey from tertiary care hospital of Winnipeg, Canada.</p>	<p>Out of 684 respondents, 504 reported routinely getting vaccinated (RV) for seasonal influenza and 180 reported routinely not getting vaccinated (NRV).</p> <p>The NRV group had lower level of concern about seasonal influenza than pH1N1.</p> <p>The most common motivators of getting</p>	38/44 = 86%

				<p>vaccinated for both NRV and RV groups related to concerns about family safety, while the choice of decline the seasonal vaccination related primarily to lack concern about illness and concern about vaccine effectiveness and safety.</p> <p>Conclusion: Educational campaigns that focus on personal benefit, engage peer champions and address concerns about the vaccine may improve influenza vaccine uptake among healthcare personnel.</p>	
<p>Lindley et al. 2014. Qualitative evaluation of Rhodes Islands HCW influenza vaccination regulations</p>	<p>United States of America</p>	<p>To evaluate Rhodes Islands revised vaccination regulations requiring healthcare workers to receive annual influenza vaccination</p>	<p>Qualitative study</p> <p>Design: Semi structured telephone interview conducted in a random sample of hospital facilities including hospitals, nursing homes, community health centers, nursing service agencies and home nursing care providers.</p> <p>Interviews were transcribed</p>	<p>Many facilities perceived the revised regulations as extending their existing influenza vaccination policies and practices.</p> <p>All facilities implemented policies that compiled with the minimum requirements of regulations.</p> <p>The main barrier to implementing the HCW regulations was enforcement of masking among unvaccinated HCWs.</p> <p>Factors facilitating implementation included</p>	<p>18/20 = 90%</p>

			and coded to identify the themes.	<p>early and regular communication from the state health department and facilities ability to adapt existing influenza vaccination programs to incorporate provisions of the revised regulations.</p> <p>Conclusion: Continued maintenance of the regulations is likely to reduce transmission of influenza and resulting morbidity and mortality in healthcare facilities.</p>	
Lorenc et al. 2017. Seasonal influenza vaccination of HCW	United Kingdom	To find evidence on healthcare workers perceptions and experiences of vaccination for seasonal influenza.	<p>Systematic literature review.</p> <p>Data are searched from MEDLINE, EMBASE and CINAHL in May-June 2016.</p> <p>25 studies are included for the research.</p> <p>Hawker et al's tool has used to assess the study quality.</p> <p>Thematic analysis method has used to analysis the data.</p>	<p>Barriers of vaccine uptakes were concerns about the side effects, doubt about vaccine effectiveness, and the belief the influenza is not a serious illness.</p> <p>HCWs value their autonomy and professional responsibility in making decisions bout vaccination.</p> <p>The implementation of interventions to promote vaccination uptake may face barrier both from HCWs personal beliefs and from the relationship between management and employees within the targeted organizations.</p>	29/48 = 60%

<p>Rashid et al. 2016. Assessing interventions to improve influenza vaccine among HCW</p>	<p>United States of America</p>	<p>To understand the evidence about interventions to improve influenza vaccine uptake among healthcare workers.</p>	<p>Systematic literature 12 randomized controlled trails have selected in this study using the PICO model. Data were collected from different databases including Ovid MEDLINE, Ovid EMBASE, Cochrane, NHS, CINAHL, PsyCHO etc.</p>	<p>This study assessed six major categories of intervention: Educational materials and training sessions, improved access to the vaccine, rewards following vaccination, organized efforts to raise vaccine awareness, reminders to get vaccinated and the use of lead advocates for vaccination. Only one of the four studies that evaluated the effect of a single intervention in isolation demonstrated a significantly higher vaccine rate in the intervention group, compared to control. -Five of the eight studies evaluated a combination of strategies showed significantly higher vaccine update. Combined interventions can moderately increase vaccine update among healthcare workers.</p>	<p>37/48 = 77%</p>
<p>Riccò et al. 2017. Knowledge, attitudes, beliefs and practices of</p>	<p>Italy</p>	<p>To access the knowledge, attitude and practices of occupational physicians</p>	<p>Cross-sectional questionnaire - based study</p>	<p>Influenza was recognized as a vaccination recommended for HCW in 89/92 of the sampled of occupational physician. However, prevalence</p>	<p>40/44 = 91%</p>

occupational physicians towards seasonal influenza vaccination: a cross-sectional study from North-Eastern Italy		about seasonal influenza vaccination and vaccination policies.	<p>(Observational study)</p> <p>In total 92 occupational physicians were asked about their attitudes towards influenza vaccine, their general knowledge of vaccine practice, their propensity towards vaccines and their risk perception about influenza and influenza vaccination</p>	<p>of misconceptions about vaccines was relatively high, with 26/92 (28.3%) and 24/92 (26.1%) referring vaccination as eliciting allergic and autoimmune diseases, respectively and identifying lethargic encephalitis (18/92, 19.6%), autism (17/92, 18.5%), diabetes mellitus (15/92, 16.3%) and multiple sclerosis (13/92, 14.1%) as causatively vaccine related.</p> <p>Conclusion: Knowledge and risk perceptions were identified as significant predictors of vaccine propensity.</p>	
Rodríguez-Fernández et al. 2016. Impact of influenza vaccine educational programme on HCP	Spain	To determine whether implementation of an influenza vaccine educational programme at a three-level pediatric hospital improved vaccination uptake in healthcare workers and the reasoning behind those changes.	<p>Cross-sectional study</p> <p>(Observational Study)</p> <p>An epidemiology survey has distributed to all healthcare personnel before and after a vaccine educational programme was implemented in October 2012. The same survey was distributed in January 2012 (Pre-programme)</p>	A simple and inexpensive educational programme significantly improved the uptake of influenza vaccination in healthcare personnel.	27/44 = 61%

			<p>and in January 2013 (Post-programme) after the influenza vaccination campaign ended for 2012 and 2013 seasons respectively.</p> <p>-18 open ended questions were included in the survey.</p> <p>80 physicians, 64 RN, 48 clinical assistants and 18 others</p>		
Squeri et al. 2017. Management of two influenza campaign in healthcare workers of a university hospital in the south Italy	Italy	To evaluate the adherence to influenza vaccination by healthcare workers and to perform a combination of educational and motivational interventions in order to increase the rate of adherence to vaccination in this workers category and improve the success of future vaccination	<p>Qualitative study</p> <p>Sample has taken from HCW and administrative units of Messina University Hospital in different two seasons 2014-2015 & 2015-2016</p> <p>First step: An anonymous face to face questionnaire was administered to HCWs and interviewed 600 people which was 21% of total sample.</p>	<p>A slightly improved in compliance trend has found, from an average of 2,3% in the previous years to 3,3% in 2014 and 7,4% in 2015.</p> <p>Reasons of low adherence level are found as fear of adverse effects, the negligence and indolence of the same workers and lack of risk perception of contracting the disease and spreads it to the patients.</p>	11/20 = 55%

		campaigns.	Second step: Vaccination campaign were carried out		
Stead et al. 2019. Improving uptake of seasonal influenza vaccination by HCW: Implementation differences between higher and lower uptake NHS trusts in England.	United Kingdom	To explore the differences in annual influenza campaign implementation between healthcare organizations with higher and lower vaccine uptake.	<p>Cross-sectional survey. (Observational study)</p> <p>The sample has taken from NHS employers from 87 NHS trusts in England.</p> <p>The survey has measured the vaccination policy and uptake target, staff involvement, accessibility, use of peer vaccinators, communication strategies, strategies to address healthcare workers concern, use of incentives and management support.</p> <p>Analysis considered implementation differences higher (n Z 50) and lower (n Z 37) uptake trusts.</p>	<p>Higher uptake trusts were most likely to set higher uptake targets, involve a broader range of staff groups in campaign, and make the vaccine easy to access by core or hard-to reach healthcare workers. Higher uptake trusts were also more likely to use a greater range of communication strategies, provide real-time feedback on update, provide a greater range of incentives to be vaccinated, and have vaccine update considered important by managers.</p> <p>Successful influenza vaccination programmes are multifaceted and involve implementation factors at a strategic, organizational, logistical, and personnel level.</p> <p>Lower uptake trusts could improve uptake by identifying and implementing examples of best practice from higher uptake trusts.</p>	37/44 = 84%

<p>Tognetto et al. 2019. Seasonal influenza vaccination among HCW: the impact of different tailored programs in four university hospitals in Rome.</p>	<p>Italy</p>	<p>To assess the impact of different program in promoting seasonal influenza vaccination uptake among healthcare workers during the season 2017/2018</p>	<p>Multicentric cross-sectional study. (Observational study) Analyzed seasonal influenza vaccination programs for healthcare workers in four University teaching hospitals in Rome.</p>	<p>The need for increasing Seasonal influenza vaccination coverage among healthcare workers was defined as a common main objective in all hospitals. Raising healthcare workers awareness about benefits and risks of influenza vaccination and making seasonal influenza vaccination more accessible for healthcare workers were stated as a common sub-objective. In an education phase: Hospital 1 has focused on academic detailing for nurses' coordinators, similarly hospital 3 & 4 has continuous medical education (CME) for healthcare workers while hospital 2 has not arrange any educational courses. In promotion field, hospital 1 & 4 had the most complete set of promotional activities (active invitation & using promotional materials), while hospital 2 spread the information about campaign through posters and banner in the intranet page, hospital 3 used only the email</p>	<p>26/44 = 59%</p>
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				<p>invitation.</p> <p>In access to vaccination field, hospitals 1, 2 & 3 organized a dedicated service for influenza vaccination at the preventive medicine service, while hospital 4 promoted a specific service within the activities of the occupational medicine unit, located at the center of the hospital. Hospital 1 also proposed an on-site vaccination service in 42 wards.</p>	
<p>Van Hooste & Bekaert 2019. To Be or not be vaccinated? The ethical aspects of influenza vaccination among healthcare workers</p>	<p>Belgium</p>	<p>To make an overview of the relevant ethical issues arising to seasonal influenza vaccination</p>	<p>Systematic literature review.</p> <p>Data's are collected from MEDLINE database from 2011-2019. Included 65 studies for full review.</p>	<p>-Mandatory vaccination has proven to work in USA to bring more vaccinations, but it leads to conflicts situations and causes disruptions in medical ethics for healthcare workers.</p> <p>-When a person chooses to work in healthcare, that person makes an autonomous choice to work in a service profession that serves the interests of vulnerable patients.</p> <p>-If a healthcare professional is not willing to take it, he/she will fail in his/her duty to patients.</p>	<p>25/48 = 52%</p>

				<p>-To increase the vaccination rate, there is a need for stronger and more comprehensive scientific evidence to support the development of practical guidelines.</p>	
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Appendix 3: Quality assessment of observational studies by STROBE method. (A)

References	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	score	
Boey et al. 2018	zz	z	zz	zz	zz	zz	zz	zz	z	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	42/44=95%
Bonfiglioli et al.2013	zz	zz	zz	zz	zz	zz	zz	zz	z	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	z	x	zz	40/44=91%
Castilla et al. 2013	zz	z	zz	zz	zz	zz	zz	zz	z	zz	zz	zz	zz	zz	zz	zz	x	zz	x	zz	z	zz	zz	36/44=82%
Hakim et al. 2011	zz	zz	zz	zz	zz	zz	z	z	x	zz	z	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	x	37/44=84%
Kraut et al. 2011	zz	zz	zz	z	z	zz	z	zz	x	z	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	38/44=86%
Riccò et al.2017	zz	zz	zz	zz	zz	zz	zz	z	x	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	zz	x	40/44=91%

Rodríguez-Fernández et al.2016	z	z	zz	zz	zz	z	x	z	x	z	zz	zz	z	z	zz	zz	x	zz	zz	z	z	x	27/44=61%
Stead et al. 2019	zz	zz	zz	zz	zz	zz	x	z	x	zz	zz	zz	zz	zz	zz	zz	x	zz	zz	zz	zz	zz	37/44=84%
del Campo et al.2011	zz	z	zz	zz	zz	zz	zz	zz	x	zz	zz	zz	zz	zz	zz	zz	x	z	x	z	z	x	32/44=73%
Tognetto et al. 2019	zz	zz	zz	z	zz	z	x	x	x	z	x	z	zz	zz	zz	zz	x	zz	zz	z	z	x	26/44=59%

1. Title and abstract of the study are defined.
2. Background of the study has explained.
3. Objectives of the study are specified.
4. Study design has presented.
5. Setting of the study has described
6. Eligibility criteria and methods of selection of participants are described.
7. Variables are clearly defined.
8. Sources and measurement of data has described.
9. Bias of the study has described.
10. Study size has explained.
11. Quantitative variables are explained.
12. Statistical methods are described.
13. Number of participants and eligibility has mentioned.
14. Description of study participants is given.
15. Outcome of the data has reported.
16. Main results of the study are given

17. Other analyses are reported.
18. Key results are summarized.
19. Limitations of the study has discussed.
20. Interpretation of the result is given.
21. Generalizability of the study has discussed.
22. Funding of the study has mentioned.

zz Satisfies the assessment criteria

z Partly satisfies the assessment criteria

x Does not satisfy the assessment criteria

Appendix 4: Quality assessment of qualitative studies according to CASP (B)

References	1	2	3	4	5	6	7	8	9	10	Score
Lindley et al. 2014	zz	zz	z	zz	zz	zz	z	zz	zz	zz	18/20=90%
Squeri et al. 2017	zz	zz	z	z	z	x	z	z	zz	z	11/20=55%

1. The aim of the research is clearly stated.
2. Appropriate qualitative research methodology has used.
3. The research design has used appropriately to address the aims of the research.
4. The recruitment strategy is appropriate to the aims of the research
5. The data has collected in a way that addressed the research issues.
6. The relation between researcher and participants has been adequately considered.
7. Ethical issues have been taken into consideration.
8. The data analysis is sufficiently rigorous.
9. Findings are clearly stated.
10. The value of research is defined.

zz Satisfies assessment criteria

z Partly satisfies assessment criteria x Does not satisfy assessment criteria

Appendix 5: Quality assessment of systematic literature reviews applied from PRISMA 2009 checklist (C)

References	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Score
Dini et al. 2017.	zz	zz	z	z	zz	zz	zz	zz	zz	x	zz	zz	z	x	zz	zz	x	zz	zz	x	zz	zz	zz	x	34/48=71%
Lorenc et al. 2017.	zz	zz	z	z	zz	z	z	zz	x	x	zz	zz	z	x	zz	zz	x	x	zz	x	zz	zz	zz	x	29/48=60%
Rashid et al. 2016.	zz	z	zz	zz	zz	z	zz	zz	zz	zz	zz	zz	z	x	zz	z	z	z	zz	z	zz	zz	zz	x	37/48=77%
Van Hooste & Bekaert 2019.	zz	z	z	zz	zz	x	z	x	x	x	zz	x	z	x	z	x	zz	z	z	zz	zz	zz	zz	x	25/48=52%

1. Title and abstract of the study are defined
2. Background of the review is described
3. Objectives of the study are stated
4. Selection criteria has specified
5. Information sources of databases has described
6. Full electronic search strategy for at least one database has presented
7. Study selection process has stated.
8. Method of data extraction from reports has described.

9. All the variables for which data were sought has listed and defined.
10. The methods used for assessing the risk of bias of individual studies has described.
11. Principal summary measures of the data have stated.
12. The method of handling data and combining results of studies has described.
13. Any assessment of risk of bias that may affect the cumulative evidence has specified.
14. Methods of additional analyses has described.
15. Study selection process is defined.
16. Characteristics of data has presented.
17. Risk of bias within the studies has presented.
18. Result of individual studies has presented.
19. Synthesis of result has presented
20. Risk of bias across studies has presented.
21. Summary of main finding has presented.
22. Limitations of the study and outcome level are discussed.
23. Conclusion of the study has provided.
24. Source of funding has described.

zz Satisfies assessment criteria

z Partly satisfies assessment criteria

x Does not satisfy assessment criteria