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REVIEW | REVISÃO

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Health professionals' knowledge about vaccination of people living with HIV – an integrative review

O conhecimento dos profissionais de saúde sobre vacinação de pessoas vivendo com HIV – uma revisão integrativa

El conocimiento de los profesionales de la salud sobre la vacunación de personas que viven con VIH – revisión integradora

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Abstract

Objective: to identify evidence in the literature about the health professionals' knowledge concerning vaccination of people living with HIV. **Method**: This is an integrative review. In this research, the descriptors used were the following: health personnel, knowledge, vaccination, HIV and its synonyms, without the use of filters, in the Pubmed, Virtual Health Library, Web of Science, Cumulative Index to Nursing and Allied Health Literature, Embase, Scopus, Science Direct and Cochrane databases. Only primary articles analyzed using the RAYYAN application were included. **Results**: Out of 601 initial publications, only five comprised the final sample, all identified in Pubmed and published between 2013 and 2018, with no Brazilian studies. Most of the publications were related to a specific vaccine and did not address the entire vaccination schedule. **Conclusion and implications for the practice**: The health professionals' lack of knowledge in relation to vaccines indicated to people living with HIV was the main aspect identified, resulting in insecurity among the professionals. There is a need for permanent education of the multidisciplinary teams of specialized services and primary care in order to reduce barriers and to increase vaccination coverage for this clientele.

Keywords: Vaccination coverage; Knowledge; HIV; Health professionals; Vaccination.

Resumo

Objetivo: Identificar evidências na literatura acerca do conhecimento dos profissionais de saúde sobre vacinação das pessoas vivendo com HIV. **Método**: Trata-se de uma revisão integrativa. Para a busca, foram utilizados os descritores: pessoal de saúde (*health personnel*), conhecimento (*knowledge*), vacinação (*vaccination*), HIV e seus sinônimos, sem utilização de filtros, nas bases de dados Pubmed, Biblioteca Virtual em Saúde, *Web of Science*, *Cumulative Index to Nursing and Allied Health Literature*, Embase, Scopus, *Science Direct* e Cochrane. Foram incluídos apenas artigos primários analisados por meio do aplicativo RAYYAN. **Resultados**: De 601 publicações iniciais, apenas cinco constituíram a amostra final, todas identificadas no Pubmed publicadas entre 2013 e 2018, sendo nenhum estudo brasileiro. A maioria das publicações estava relacionada a alguma vacina específica e não abordava todo o calendário vacinal. **Conclusão e implicações para a prática**: O déficit de conhecimento dos profissionais de saúde, em relação às vacinas indicadas às pessoas vivendo com HIV, foi o principal aspecto identificado, resultando em insegurança dos profissionais. Há a necessidade de educação permanente das equipes multiprofissionais dos serviços especializados e da atenção primária visando diminuir as barreiras e aumentar a cobertura vacinal desta clientela.

Palavras-chave: Cobertura vacinal; Conhecimento; HIV; Profissionais de saúde; Vacinação.

Resumen

Objetivo: Identificar evidencias en la literatura acerca del conocimiento de los profesionales de la salud sobre la vacunación de personas que viven con VIH. **Método**: Revisión integradora. Para la búsqueda, se utilizaron los descriptores: personal de salud (*health personnel*), conocimiento (*knowledge*), vacunación (*vaccination*), VIH y sus sinónimos, sin el uso de filtros, en las bases de datos Pubmed, Biblioteca Virtual en Salud, *Web of Science*, *Cumulative Index to Nursing and Allied Health Literature*, Embase, Scopus, *Science Direct* y Cochrane. Solo se incluyeron los artículos primarios analizados mediante la aplicación RAYYAN. **Resultados**: De 601 publicaciones iniciales, solo cinco constituyeron la muestra final, todas identificadas en Pubmed y publicadas entre 2013 y 2018, sin ningún estudio brasileño. La mayoría de las publicaciones estaban relacionadas con una vacuna específica y no abordaban todo el calendario de vacunación. **Conclusión e implicaciones para la práctica**: El desconocimiento de los profesionales de la salud en relación a las vacunas indicadas para personas que viven con VIH fue el principal aspecto identificado, lo que generó inseguridad entre los profesionales. Se advierte la necesidad de disponer la educación permanente de los equipos multiprofesionales de servicios especializados y de atención primaria para reducir barreras y aumentar las coberturas de vacunación de esta clientela.

Palabras clave: Cobertura de vacunación; Conocimiento; VIH; Profesionales de la salud; Vacunación.

INTRODUCTION

In recent years, there have been many changes regarding the epidemiological characteristics of the human immunodeficiency virus (HIV) infection. According to the *Joint United Nations Program on AIDS/HIV* (UNAIDS), nearly 38 million people are living with HIV (PLHIV) worldwide and 690,000 individuals have died as a result of AIDS up to 2020[1].

In Brazil, AIDS is of mandatory notification since 1986, and HIV infection since 2014. As for the number of cases, what is observed is a decrease in the percentage of AIDS cases, with a reduction of 18.7% in the detection rate from 2012 and of 28.1% in the mortality rate from 2014 to 2019. On the other hand, the number of cases of HIV infection continues to increase in the country and, in 2019, 41,909 new cases were diagnosed[2].

In recent years, the model of care for PLHIV in Brazil has undergone changes with the growing participation of the primary care services in the development of promotion, prevention, diagnosis and follow-up actions for this clientele in Primary Health Care (PHC)[3].

The reduction in the number of AIDS cases and deaths in Brazil is directly related to the treatment proposed by the Ministry of Health with the "continuous HIV care cascade", which encourages early diagnosis, connection and retention of the individual to the health service and early initiation of Antiretroviral Therapy (ART) with the objective of suppressing viral load[4].

With the advances observed in the care of PLHIV, the infection has become a chronic condition, the individuals have achieved greater survival and better quality of life and, consequently, are more exposed to the risk of acquiring other infectious diseases, including those that are vaccine-preventable. In this context, the importance of health promotion and disease prevention actions among this population in all spheres of the health care networks is highlighted, which includes immunization actions[5].

The condition caused by HIV infection is quite heterogeneous, ranging from immunocompetence to severe immunodeficiency, which places PLHIV at an increased risk for many viral, bacterial and fungal infections[6]. Thus, it is essential to understand the individual's immunosuppression degree for the indication of vaccines. Vaccination of individuals with a high immunosuppression degree, through vaccines with live attenuated agents, increases the possibility of adverse events and, if they are vaccinated with inactivated vaccines, the response can be insufficient[7].

For PLHIV there are specific recommendations for vaccination, as this group presents a higher risk of morbidity and mortality from vaccine-preventable diseases[8,9]. As it is a very specific and heterogeneous group in which the vaccine response depends on the immunosuppression degree and which can develop adverse events from inadvertent vaccination in cases of high immunosuppression, the complexity of the aspects involved in the vaccination of PLHIV raises several questions in health professionals[7].

Despite the increased risk of infections and the availability of an increasing number of vaccines, vaccination rates in PLHIV remain lower than in the general population[6,9].

It is recommended that the assessment of the health situation (clinical signs and symptoms), the history of previous diseases and the vaccination history of the individual who receives the diagnosis of HIV infection are carried out during the first visit in the service where follow-up is conducted. Based on the evaluation of the exams at the first visit (CD4 T cell count, viral load, anti-HBs and anti-HAV IgG serology), it is recommended to update the vaccination scheme, and this recommendation can be performed by any of the health professionals of the multidisciplinary teams that monitor the individual, specialists or PHC professionals[4,9].

Health professionals properly trained for the vaccine schemes for PLHIV can contribute to improving vaccination coverage in this clientele, evaluating the individuals' vaccination history and indicating the appropriate vaccines in accordance with the established protocols, so that they contribute to the reduction in morbidity and mortality due to vaccine-preventable infections.

In addition to that, it is important that the vaccination status of the health professionals involved in the care of PLHIV and the household contacts of these patients be evaluated and, if necessary, updated, with a view to avoiding vaccine-preventable diseases, especially for those with contraindications to receiving any immunobiological agent[7,9].

However, little is known about the health professionals' knowledge in relation to this theme; for this reason, and considering the problem as a public health reality, the objective of this paper is to identify in the literature the aspects involved in the health professionals' knowledge regarding vaccination of PLHIV.

METHOD

This study is an Integrative Review (IR), an evidence-based practice instrument, carried out in a systematic and rigorous way, which allows for the inclusion of several research methods, both experimental and non-experimental, for a broad understanding of the studied phenomenon[10-12].

This study was developed from the following stages: elaboration of the research question, establishment of the eligibility criteria, search in the literature, definition of the information to be extracted from the studies selected, data collection, critical analysis of the publications selected, interpretation of the results and knowledge presentation/synthesis[11,12].

The research question was elaborated from the PICo acronym, with the health professionals as "population" (P), knowledge as the phenomenon of "interest" (I) and vaccination of people living with HIV as the "context" (Co)[13]. Therefore, this question was the following: "What is the health professionals' knowledge in relation to PLHIV vaccination?".

The search for studies took place in the Pubmed, Virtual Health Library (*Biblioteca Virtual em Saúde*, BVS), Web of Science, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Embase, Scopus (Elsevier), Science Direct and Cochrane databases during December 2020. A manual search was also conducted in the references of the articles selected for full reading.

The search strategy consisted of descriptors and their synonyms identified in the Health Sciences Descriptors (*Descritores em Ciência da Saúde*, DeCS) and their English equivalents identified in the Medical Subject Headings (MeSH). In between the descriptors and their synonyms, the Boolean operator OR was used within the term sets of the PICo strategy, and, for the crossing of groups of descriptors, the Boolean operator AND was used (Chart 1).

The search files of each database were imported into the RAYYAN application, where the titles and abstracts were evaluated by two independent reviewers based on the eligibility criteria, and a third reviewer resolved any and all disagreements[14].

Primary articles that presented data referring to the health professionals' knowledge in relation to vaccination of PLHIV were included, either for the entire vaccination schedule or for specific vaccines with an indication for this population. For the articles selected, extraction of the information was performed to a spreadsheet developed in Excel by the authors from the adaptation of an instrument already validated with the following variables: title of the article, database where it was identified, name of the journal, authors' names, country, language, year of publication, institution that was the study locus, design, objective, sample, inclusion/exclusion criteria, results, data analysis, conclusions, level of evidence and evaluation of methodological rigor[10,12,15].

To determine the level of evidence, the following classification was used: Level I - meta-analysis of randomized and controlled clinical trials, Level II - randomized and controlled clinical trials, Level III - non-randomized clinical trials, Level IV - case-control and cohort studies, Level V - systematic reviews, descriptive and qualitative studies, Level VI - opinions of authorities and/or of expert committees. To assess methodological rigor, clarity of the methodological trajectory and identification of biases or limitations were verified[10,12,15,16].

A total of 601 publications were identified, with 155 duplicate records and 436 exclusions after analyzing the eligibility criteria. When searching for the full studies, two papers that were not primary studies were excluded, one of which consisted of a study published in the annals of a paper presented in a congress and the other being a project registered in a research protocol. The manual search did not identify any publication that met the eligibility criteria.

Eight publications remained for full reading, after which three were excluded, two of them addressing immunization of PLHIV, although they did not address the professionals' knowledge about the topic; and the other addressing the knowledge regarding the vaccine against Herpes Zoster, although it was not related to the population living with HIV (Figure 1).

The critical analysis of the publications selected and the knowledge synthesis were performed descriptively from the data collected in the data extraction spreadsheet. Through thematic analysis, the variables were described and later interpreted seeking common topics among the studies that were then divided into two categories: Studies evaluating the entire vaccination scheme indicated for PLHIV and Studies evaluating only one vaccine indicated for PLHIV[18].

RESULTS

Chart 1. Search strategies in Portuguese and English used in the Virtual Health Library and Pubmed databases. Ribeirão Preto, SP, Brazil, 2020.

Database	Search strategy used
BVS	("pessoal de saúde" OR "prestadores de cuidados de saúde" OR "profissionais da saúde" OR "profissionais de saúde" OR "profissional da saúde" OR "profissional de saúde" OR "trabalhador da saúde" OR "trabalhador de saúde" OR "trabalhadores da saúde" OR "trabalhadores de saúde") AND (conhecimento OR conhecer OR conhecimentos OR epistemologia OR "unidade de conhecimento" OR "unidade do conhecimento" OR "unidades de conhecimento" OR "unidades do conhecimento") AND (vacinação OR "imunização ativa") AND (HIV OR "vírus da AIDS" OR "vírus da imunodeficiência humana" OR "vírus de imunodeficiência humana")
Pubmed	("health personnel" OR "personnel, health" OR "health care providers" OR "health care provider" OR "provider, health care" OR "healthcare providers" OR "healthcare provider" OR "provider, healthcare" OR "healthcare workers" OR "healthcare worker" OR "health care professionals" OR "health care professional" OR "professional, health care") AND (knowledge OR epistemology) AND (vaccination OR "vaccinations" OR "immunization, active" OR "active immunization" OR "active immunizations" OR "immunizations, active") AND (HIV OR "human immunodeficiency virus" OR "immunodeficiency virus, human" OR "immunodeficiency viruses, human" OR "virus, human immunodeficiency" OR "viruses, human immunodeficiency" OR "human immunodeficiency viruses" OR "AIDS virus" OR "AIDS viruses" OR "virus, AIDS" OR "viruses, AIDS" OR "acquired immune deficiency syndrome virus" OR "acquired immunodeficiency syndrome virus")

Source: Review Data, Ribeirão Preto/SP, 2021

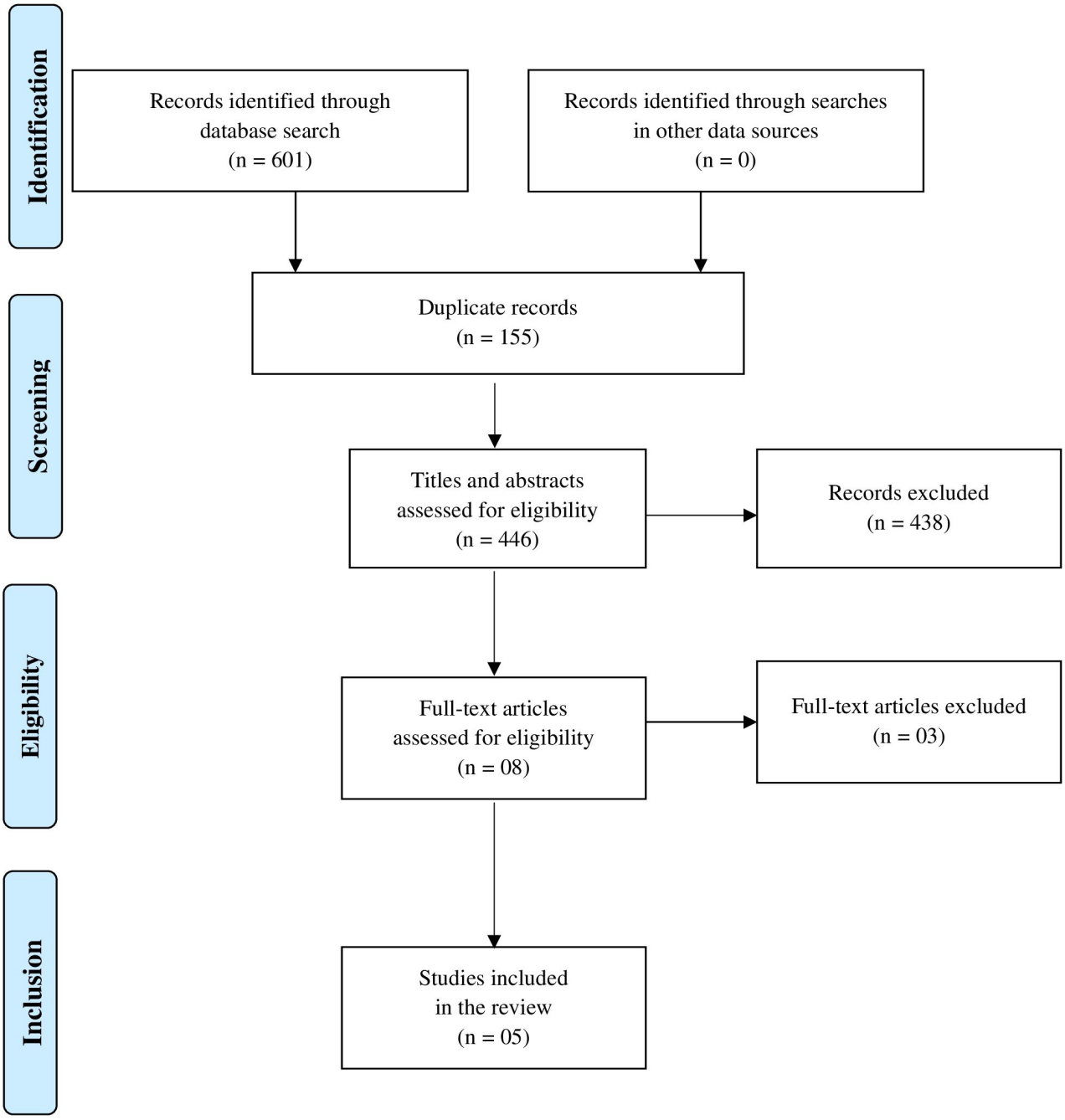

Figure 1. Flowchart corresponding to the study selection process.[17]
Source: Ribeirão Preto, SP, Brazil, 2021

The final sample consisted of five articles, the years of publication were as follows: one in 2013 (20.0%), two in 2016 (40.0%), one in 2017 (20.0%) and one in 2018 (20.0%), all (100%) in English. 3 papers (60.0%) were from the USA, one (20.0%) was from the United Kingdom and another (20.0%) was from South Africa (Table 1).

The institutions that were locus of the studies (40.0%) were universities; one study (20.0%) was conducted by a Traveler's Medicine Center and two are multicentric studies (40.0%).

In relation to the study population, three studies (60.0%) had as inclusion criteria that the professionals who answered the questionnaire were treating PLHIV in their professional practice; however, for another two studies (40.0%), this was not a criterion for inclusion of professionals in the research. All the articles

Table 1. Publications selected according to year of publication, country where the study was conducted, title, journal and authors. Ribeirão Preto, SP, Brazil, 2021.

N	Year	Country	Title	Journal	Authors
1	2013	USA	Providers' lack of knowledge about herpes zoster in HIV-infected patients is among barriers to herpes zoster vaccination.	International Journal of STD & AIDS	Aziz M, Kessler K, Huhn G
2	2016	United Kingdom	Enquiries to the United Kingdom National Travel Advice Line by healthcare professionals regarding immunocompromised travellers.	Journal of Travel Medicine	Allen JE, Patel D
3	2016	USA	Knowledge of Vaccination Needs of HIV-Infected Men Who Have Sex with Men in a National Sample of "Gay Friendly" Health Care Providers.	Public Health Nursing	Blackwell CW
4	2017	South Africa	Knowledge, attitudes and practices of South African healthcare workers regarding the prevention and treatment of influenza among HIV-infected individuals.	PLOS ONE	Duque J, Gaga S, Clark D, Muller M, Kuwane B, Cohen C et al.
5	2018	USA	HPV-Related Cancer Prevention and Control Programs at Community-Based HIV/AIDS Service Organizations: Implications for Future Engagement.	Frontiers in Oncology	Wigfall LT, Bynum SA, Brandt HM, Sebastian N, Ory MG

Source: Review Data, Ribeirão Preto/SP, 2021.

selected (100%) were classified with Level of evidence V, as they are non-experimental descriptive studies (cross-sectional studies) with a quantitative approach[15]. All the studies (100%) were conducted with samples selected by convenience.

In the first category of studies, two evaluated the general knowledge regarding vaccination of the immunosuppressed population or specifically HIV, one of them being related to the immunization of immunosuppressed travelers[19], and the other in relation to the immunization of men who HIV-infected have sex with men (MSM)[20]. The studies showed that the health professionals who treat PLHIV have many doubts regarding vaccines indicated for this population and their contraindications, especially in relation to the attenuated vaccines. The authors reinforce that doubts among health professionals remain despite the countries providing established immunization protocols (Table 2).

When assessing the phone calls made by health professionals to a traveler's health center in the United kingdom for advice on immunocompromised travellers, they verified that most of the contacts were related to doubts regarding the vaccine, mainly about attenuated vaccines, although many professionals also expressed doubts in relation to the indication of inactivated vaccines. Calls for counseling in relation to travelers with HIV accounted for 11% of the total but, of these, only 32% were aware of CD4 T-cell count and only 27% about viral load. In this study, despite a sample of adequate size, data collection was performed retrospectively, which limited data analysis because important information (such as the the patients' immunosuppression level) was lacking[19].

Another study, conducted in the USA, evaluated the health professionals' knowledge from a list of "gay friendly" professionals in relation to the vaccine needs for high-risk populations such as men who have sex with men (MSM), both HIV-seropositive and HIV-seronegative. In the group of professionals evaluated, only 11% correctly identified the vaccines indicated for HIV-seropositive MSM. Primary health care professionals showed greater ability to correctly identify the vaccines indicated for this population, as well as those who administer vaccines in their practice, and those with greater familiarity with the vaccination protocols. The study sample was small, not representative of the population, with a motivation bias (most of the participants identified themselves as homosexuals), and coming from a single data source (list of professionals enrolled in the Medical Association of Gays and Lesbians), factors that limited the study[20].

In the second category, three studies were included that evaluated the health professionals' knowledge in relation to only one of the vaccines indicated for PLHIV. One of the studies in the USA evaluated the knowledge of health professionals who treated PLHIV in relation to the incidence and severity of herpes zoster to verify whether this knowledge and the professionals' practice with immunization would contribute to recommending vaccination against the disease. Most of the study professionals indicated vaccines from the country's vaccination schedule for PLHIV, but were unaware of the principles of vaccination against herpes zoster or were not sure in the indication of the vaccine. One limiting factor of the study is its sample size, which is not representative of all the health professionals, and the answers

Table 2. Publications selected according to results and limitations or biases according to the thematic category in which they were included for analysis. Ribeirão Preto, SP, Brazil, 2021.

N	Results	Limitations or Biases
Category 1 – Studies evaluating the entire vaccination scheme indicated for PLHIV		
2	The health professionals (HPs) routinely vaccinated their patients in the practice – Influenza (91.2%), Hepatitis A (86.0%), Hepatitis B (92.4%), Pneumonia (87.2%), Tetanus (75%). More than 75% of the HPs do not vaccinate their HIV patients against varicella zoster. Barriers to vaccination: unproven vaccine safety, efficacy concerns, risks of dissemination, insurance/reimbursement problems, the Infectious Diseases Society of America (IDSA) guidelines do not recommend vaccination.	The response rate was low and may not be representative of all the HPs who treat PLHIV, it depended on self-report (the practices and behaviors were not observed).
3	267 surveys (67%) were on vaccines; 77 surveys (20%) were on vaccines and malaria prophylaxis; and 44 surveys (11%) were on malaria prophylaxis. Of the vaccine-related surveys (344), 60% were related to live vaccines, 23% to inactivated vaccines and 17% to both vaccines. Of the total number of surveys, 44 (11%) were about travelers with HIV. CD4 T lymphocyte count was known only for 14 travelers (32%) and Viral Load (VL) for 12 travelers (27%) - 10 undetectable. Use of ART was identified for 22 travelers - 21 (48%) used it and 1 (2.3%) did not.	Retrospective study; it depended on the nurse's/ counselor's registration; it lacked clinical information (this was not the main objective).
Category 2 – Studies evaluating only one vaccine indicated for PLHIV		
1	Nearly 11% correctly identified the necessary vaccines for HIV-infected MSM. The statistically significant variables associated with greater knowledge of the need for vaccination were as follows: greater familiarity with the vaccination scheme for adults, practical specialization, and administration of vaccines in the workplace.	Small sample, motivation bias (most of the study participants were homosexuals), sample derived from only one source, racial variety does not reflect the country's ethnic variation.
4	70% think that the vaccination of HPs helps protect patients from influenza; the most important reason to get vaccinated is to protect their family and the patients; 34% reported having received the vaccine in the last seasonality, 63% received it at some point in their lives (the physicians were the professionals less prone to vaccination). Variables related to receiving the vaccine: access, vaccine available at no cost and having undergone training on influenza. 94% of the professionals recommended the vaccine to their patients. Variables related to the higher probability of recommending the vaccine: self-reported vaccination 2013/2014; availability of the vaccine during the consultation, knowing the vaccination guidelines and having undergone training on influenza.	A study limited to the public sector, the study may not be representative of the private network professionals or of those form South Africa in general (it was conducted in 5 out of 9 provinces).
5	77% had heard of the vaccine against HPV, 52% thought that the vaccine was safe and 43% thought that it was effective, 47% thought that the vaccine could prevent cervical cancer. All the employees were willing to encourage women and MSM to talk to their providers about the vaccine against HPV.	Small sample, not generalizable to teams from other locations. It did not evaluate gay stigma as a barrier for access to health.

Source: Review Data, Ribeirão Preto/SP, 2021

were based on self-reports from professionals enrolled in a continuing education program in HIV[21].

Another study evaluated evaluated, with health professionals in public hospitals, clinics and health centers from five South African provinces, the knowledge, attitudes and practices related to the prevention and treatment of influenza, especially for PLHIV. Of the professionals who answered the instrument used in the research, 71% believed that vaccinating health professionals against influenza helped to protect the patients, and that the main reason for vaccination was to protect their families and the patients. Most of the professionals were aware that vaccination against Influenza was performed annually in the country and knew the national vaccination protocol, but only 19% of them had received some training on Influenza and its vaccine. In addition to that, only 34% of the professionals reported having received the vaccine in the last year, and the physicians were the professionals who were less likely to get vaccinated. The variables related to vaccination of the professionals were ease of access, vaccine available at no cost and having undergone training on influenza. Of the professionals interviewed, 94% recommend the vaccine against influenza for HIV-seropositive patients, and the variables related to the higher probability of indicating the vaccine were self-reported vaccination by the professional in the last year, availability of the vaccine during the consultation, having knowledge in relation to the vaccination guidelines and having undergone training on influenza. The limitation of the study was that it was carried out only with public service health professionals and in 5 of the 9 South African provinces, with its sample not being representative of the entire population of health professionals[21].

The third study in this category evaluated, in the USA, the health professionals' knowledge in relation to human papillomavirus (HPV) and the prevention of cervical cancer resulting from vaccination, and compared the data with a population survey conducted in the same region. According to data shown by the authors, women living with HIV are three times more prone to develop cervical cancer when compared to those not infected with HIV. Despite the increased risk in this population and the benefits of vaccination, the authors report that vaccination coverage is low and that many vaccination opportunities are missed. In this study, most of the health professionals had heard about the vaccine against HPV, nearly half of them believed that it was safe and effective and that it could protect against cervical cancer, and all the interviewees were willing to promote communication between the professional and the patient about vaccination against HPV. One factor indicated as a limitation in this study was its sample size, which, for being small, does not allow generalizing the data to the entire population[22].

Lack of knowledge in relation to the the vaccines indicated for PLHIV or to the specific issues related to the vaccine evaluated was identified in three studies (60%) of this review. Continuing education activities in immunization for health professionals were presented in four studies (80.0%) as important to increase the health professionals' confidence in the vaccines and, consequently, enhance vaccine access and coverage in PLHIV.

DISCUSSION

This review showed that the number of studies evaluating the health professionals' knowledge regarding the vaccination process for PLHIV is low, and that most of them are related to some specific vaccine and do not address the entire vaccination schedule.

The studies from the first category presented highlight the lack of research evaluating the professionals' knowledge in relation to the vaccination scheme indicated for PLHIV and reinforce the need to better train the professionals during their qualification and throughout their career, in addition to facilitating access to the available protocols.

Updating the vaccination scheme for adults is a major challenge, as little is known about such coverage in this population and it is believed that the majority is not immunized[23-25]. Some population groups are more susceptible to diseases and therefore need special protection. In this group, PLHIV stand out, who, if not showing signs of immunosuppression, can be vaccinated with all the vaccines available in the vaccination schedule, in addition to the special ones indicated for them[4,8].

It is up to the health professional to evaluate the vaccination status and indicate the necessary vaccines to start or complete the vaccination scheme; however, this evaluation is somewhat complex and requires knowledge of the available vaccines indicated and their contraindications, since the higher the immunosuppression, the greater the possibility of harms in the vaccine response, in addition to increasing the risk of adverse events[4,9,23].

Inactivated vaccines are not contraindicated for immunocompromised people and, even so, low vaccination rates are observed in the literature, as well as doubts among the health professionals regarding indication of these vaccines for immunosuppressed patients[17,26]. The study conducted with PLHIV followed-up in an outpatient clinic from the municipality of São Paulo showed that only 16.7% of them had a complete vaccination scheme for inactivated vaccines, and the authors pointed out that it is necessary to increase knowledge in relation to the vaccines for HIV-infected people in continuing education programs for the health professionals[24].

However, for the attenuated vaccines it is necessary to assess the risk and benefit of vaccination taking into account that these individuals are also more exposed due to frequent contact with the health services. On the other hand, data on the safety, efficacy and immunogenicity of the vaccines in the immunocompromised population are limited, which causes certain insecurity in the health professionals, especially in physicians when prescribing immunobiologicals for these patients[7-9,27,28].

It is necessary that the health professional is aware of important immunosuppression markers (viral load, CD4 count, medications in use), considering that this information is extremely important to evaluate the indication of vaccines for PLHIV.

Another relevant aspect is the importance of the health professional in compliance with vaccination, since better knowledge on the subject matter was associated with greater familiarity with the vaccination scheme for adults by the professionals, their

specialization (primary care/infectology) and the fact that the vaccine is administered in the place where the professionals work. Patients tend to trust health professionals, so the indication of vaccination by the latter is important. Therefore, training of the professionals needs to include content related to vaccination of PLHIV; applications that contain the vaccination schedule/scheme for this population aimed at health professionals can be helpful[29].

The vaccine against influenza is an inactivated vaccine, has no contraindications in HIV-seropositive people, and can be administered even in immunosuppressed individuals with a CD4 T cell count below 200 cells/mm^3; however, these individuals may have an impaired response. Vaccinating health professionals and their household contacts against influenza increases the guarantee of protection for people who are immunosuppressed. In addition to that, health professionals, mainly those who monitor PLHIV, play an essential role in recommending and prescribing vaccines for the patients and their families[9,25,27].

In this same direction, another study carried out in Austria showed that HIV-positive patients who received information about vaccination from the attending physician were more prone to be vaccinated against influenza. Direct recommendation of vaccination to the patients was even more effective than just informing them about the vaccine. Thus, the fact that the physicians inform their patients about the importance of vaccination and help them to overcome certain complicating factors, such as fear of side effects, can effectively increase vaccination rate[26].

Well-trained health professionals are more likely to receive and recommend the vaccine; however, we cannot fail to emphasize that achieving vaccination coverage depends on multiple factors in addition to the professional's recommendation[29].

One of the ways to improve vaccination coverage in PLHIV is to incorporate vaccination rooms in the outpatient clinics where they are followed-up[24]. In a study carried out in Fortaleza/CE, 4.7% of the individuals with HIV reported not having financial resources to attend a vaccination service. The authors emphasize the importance of the multi-professional team in the education in health process to improve vaccination coverage in this population and emphasize the role of vaccine room professionals in ensuring that the patients return to complete the vaccination scheme[5].

In a study developed in Espírito Santo where vaccination coverage in individuals with HIV was evaluated, the best coverage was for the vaccine against diphtheria and tetanus (59.79%), available in the vaccination rooms for all individuals; and the lowest coverage was for the vaccines with special indication by the Special Immunobiological Reference Centers (*Centros de Referência em Imunobiológicos Especiais*, CRIEs), namely: the vaccines against Hepatitis A (6.8%) and Meningococcal C (6.0%). These data show that, even for the inactivated vaccines without contraindications for PLHIV, vaccination coverage is very low[25].

One of the vaccines with a special indication for PLHIV is that against herpes zoster. In one of the studies included in this review[21], the authors emphasize that this is the most common opportunistic infection in HIV-infected adults and that these patients are more prone to severe cases, in addition to the higher recurrence rate. Since 2008, vaccine use has been standardized in the immunocompromised population by the USA Centers for Disease Control and Prevention (CDC) and by the Advisory Committee on Immunization Practices (ACIP). Despite this, the study participants did not feel confident to recommend the vaccine to their patients. As a barrier to vaccination, the professionals reported the lack of studies to guarantee its effectiveness in this population, which also raises concerns about the risk of dissemination, in addition to problems for the reimbursement of health insurance. The authors reinforce the importance of training the professionals in relation to the indications, safety and efficacy of the vaccine and the need to better understand the causes of the lack of knowledge in this regard.

In Brazil, the vaccine against herpes zoster is a live attenuated virus vaccine, recommended for PLHIV over the age of 50, without signs and symptoms of immunosuppression; however, it is not offered by the National Immunization Program (*Programa Nacional de Imunizações*, PNI) and, therefore, is only available in the vaccination clinics from the private network, which can lead to low vaccination coverage against the diseases caused by herpes zoster[27,30].

The concern with the safety and efficacy of vaccines among immunosuppressed people, mainly for those that have been most recently introduced into the vaccination schemes, such as the vaccine against HPV[22], is reinforced by other authors, as this may collaborate for many vaccination opportunities to be lost. It is important that the multi-professional team is updated on the vaccination guidelines, which are constantly updated, so that they are sure to guide and indicate vaccination. In a study developed in Brazil with PLHIV in outpatient care, 63.5% of the individuals were not instructed about the number of doses and the vaccination scheme and 16.5% were unaware of its benefits[5].

Finally, it is emphasized that low knowledge can be associated with PLHIV's hesitation regarding vaccines, which constitutes an additional barrier to vaccination. A number of studies show that low vaccination rates include fear of the side effects, lack of concern about prevention, concern that the vaccine might worsen the course of HIV infection, and belief that vaccination would fail due to a compromised immune system[26,31]. Thus, health education practices must be implemented for both professionals and patients, in order to improve compliance with vaccination and, consequently, disease prevention.

CONCLUSION AND IMPLICATIONS FOR THE PRACTICE

Few studies were identified addressing the theme of the professionals' knowledge in relation to vaccination of PLHIV, and none of the studies identified was carried out in Brazil. The restricted number of publications was a limiting factor in the study, as it makes it difficult to analyze other elements that may be important in the health professionals' knowledge in relation to the vaccination process for PLHIV.

The indication of vaccines for HIV-seropositive people requires specific knowledge and this assessment cannot be carried out only by the Vaccine Room teams, evidencing the need for the participation of teams from the specialized care services and primary health care. Therefore, it is a responsibility of the multi-professional team.

The professional's lack of knowledge about the recommendations for the immunization of PLHIV contributes to the loss of vaccination opportunities and constitutes a barrier to routine vaccination in many clinical settings, a common and current scenario in vaccination against COVID-19. Although several Brazilian services that perform clinical and outpatient monitoring of PLHIV have vaccination rooms, their convenience is minimized when the professionals responsible for this task, permeated by insecurity, choose not to apply the complete vaccination scheme for PLHIV who seek for the service, deprived from a referral by a health professional stating their immune status as well as the vaccines they should receive.

Knowledge in relation to the vaccines indicated for PLHIV and their contraindications must be shared by the health professionals in all spheres of the health care networks, both in primary care and in specialized services, in addition to involving health professionals from different backgrounds. Adequate vaccination coverage of PLHIV contributes significantly to reducing morbidity and mortality due to vaccine-preventable diseases among PLHIV. Therefore, education of these professionals must be permanent and continuous since their training. The nurse and the Nursing team play a prominent role with regard to immunization. Thus, future studies that assess knowledge about PLHIV vaccination among the Nursing team are recommended.

AUTHOR'S CONTRIBUTIONS

Design of the review study. Larissa Gerin. Marcela Antonini. Elucir Gir. Renata Karina Reis.

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