Health Workers' knowledge and perception regarding the risk of spread of COVID-19 during the pandemic: A systematic review

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Certain Health Workers (HWs) may have inadequate knowledge and perceptions regarding COVID-19. As a result, they may not be completely aware of the danger/risk involved, which could impact their ability to control the spread of the virus. This systematic review aims to enhance HWs' knowledge and their perception of the spread risk of COVID-19 during the pandemic. A search was conducted in four databases (Medline, CINAHL, Scopus, and ScienceDirect) to locate peer-reviewed studies published in English between January 2020 and April 2020. Eventually, nine articles satisfied the inclusion criteria and were, therefore, included in the present study. Six of the aforementioned studies specifically investigated HWs' perception of risk. Apart from a study that indicated medium perception (min = 56.5%), all other studies found high levels of risk perception (n = 5, max 92.1%). As for HWs' knowledge, apart from two studies that indicated medium percentage levels (min = 56.5%), the rest of the studies report high percentages (n = 7, max = 93.2%). Two of the studies, which assessed the sources of information that HWs use, agree that social media is the most widely used source of information. The findings of this study suggest that HWs had a satisfactory perception of risk during the spread of COVID-19. Although fields with medium knowledge levels were identified, HWs' overall knowledge may also be described as satisfactory. It is also noted that certain demographic characteristics (occupation, age, and years of experience) appear to affect HWs' knowledge and perceptions. The application of educational strategies aiming to provide continuous support to HWs is unanimously recommended by all studies.

1 | INTRODUCTION

The coronavirus disease, COVID-19, and internationally the sars-COV2 virus, constitutes an issue of international concern regarding public health since it is a potentially fatal disease. In late December 2019, a cluster of patients was admitted to hospitals with an initial diagnosis of pneumonia of unknown cause. Based on an epidemiological link, uniform exposure of these patients was detected at an animal market in the city of Wuhan, China. Due to this fact, it is speculated that the origins of the virus are likely to be zoonotic (Rothan & Byrareddy, 2020). For the current pandemic to be controlled, extended prevention measures have been taken, with particular emphasis on a susceptible and vulnerable population, including health care providers and the elderly. For example, patients are isolated to limit the transmission of the virus from one person to another (McBride et al., 2020; Rothan & Byrareddy, 2020).

According to WHO (2020), the COVID-19 disease outbreak has become a pandemic, which has, so far (September 2020), infected more than 30 million people and has caused more than 900,000 deaths worldwide. The abovementioned statistics include many HWs, a fact which adds another important concern to the chain of infection, which must be dealt with immediately (Zhou et al., 2020). Likely, certain HWs are not sufficiently aware of prevention policies, and their erroneous practices and attitudes directly increase the risk of the
spread of the virus (McEachan et al., 2016). Based on the recent literature, it appears that many researchers are trying to expand HWs' knowledge and perceptions regarding the COVID-19 (Giao et al., 2020; Shi et al., 2020; Zhou et al., 2020; Bhagavathula et al., 2020; Nemati, Ebrahimi, & Nemati, 2020). According to WHO (2006), the term Health Workers is used to refer to any person engaged in actions whose primary intent is to enhance health.

Given that HWs' knowledge is of high importance for the prevention of the spread of the disease, and taking into consideration the significance of prevention measures during professional exposure, strategic models for the improvement and enrichment of the existing data must be developed. It has been observed that there are several deficiencies in the systematic and documented information of the existing international literature concerning the knowledge and perception of HWs during the spread of COVID-19. This study constitutes, as far as we are aware, the first systematic review of this particular field.

Research of the existing literature was conducted to locate studies that examined the knowledge and perceptions of HWs during the spread of COVID-19. The specific research questions that were examined are: (a) What is the HWs' knowledge level during the spread of COVID-19? (b) What is the HWs' level of perception of the risk related to the COVID-19 pandemic?

2 | MATERIALS AND METHODS

A protocol was created before the study was conducted and, also, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher, Liberati, Tetzlaff, & Altman, 2009) guidelines have been followed. Due to the essential heterogeneity of the population and the data collection methods of targeted research studies, the results collected were not combined for meta-analyses.

2.1 | Eligibility criteria

The criteria for the inclusion of the studies were the following: (a) Primary studies that followed any methodological design; (b) studies presenting knowledge and perceptions during the spread of COVID-19; (c) HWs are used as a sample (as they are defined by WHO).

The criteria for the exclusion of studies were: (a) Secondary studies (editorials, commentaries, and reviews); (b) or studies that focused on psychological fields (anxiety, depression, etc.); (c) or a sample that does not fall into the category of HWs (the public, patients, students and people not employed in the health sector).

2.2 | Information sources

The research was conducted using four electronic databases (Medline, CINAHL, Scopus, and ScienceDirect) with a language limitation (studies published in English), a time limitation (January 2020 until April 2020), and using only peer-reviewed periodicals. Further research was done using other sources (Google Scholar, bibliography/reference lists of other studies) so that no articles would be excluded that could be included because they were relevant and reliable.

2.3 | Search strategy

The subject terms used, and the way (Boolean operators, limitations) the search was conducted, resulted in only locating articles referring to the relevant population, intervention, and results related to this study. An example of the strategic search on CINAHL through EBSCO can be seen in Table 1. The search was repeated on May 15, 2020. The results of the search were stored with the use of reference management software.

2.4 | Study selection process

The PRISMA flow diagram (Figure 1) provides information regarding the process of selecting studies. Through the aforementioned search strategy, the articles (n = 5,102) were checked for duplication using reference management software. Subsequently, two independent researchers (G.P. and Z.R.) examined the articles in three stages. During the first stage, only the headings of the articles were checked (n = 4,552). The summaries of the articles were checked in the second stage (n = 374). If there was any disagreement or if the information included in the heading or the summary was not clear, then it was deemed necessary to further evaluate the article (third stage). Finally, during the third stage, the same researchers evaluated the full text of the articles remaining (n = 17) regarding population and outcomes, which were related to this systematic review's scope of interest. In case of disagreement regarding eligibility, the disagreement was resolved through discussion.

2.5 | Data collection process

Two independent authors (G.P. and Z.R.) exported the data, on a pilot basis, to a predesigned document, under the following categories: (a) First author/Study Design/Country where the study was conducted, (b) Population-target and size, (c) Demographic characteristics of the studies (Age, Years of Experience, Gender, Occupation), (d) Purpose of study, (e) Type and period of sample collection, (f) Data collection method, (g) Main findings (knowledge, perceptions, sources of information). The concluding summary of the studies is provided in Table 2.

2.6 | Assessment of quality

The quality of the eligible studies was evaluated using the National Institutes of Health Quality Assessment Tool for Observational
Specifically, apart from a study Bhagavathula et al. (2020), which appeared to have been conducted mainly in the Asian continent. The search has yielded nine articles to be analyzed (Figure 1). The studies, apart from their design, were heterogeneous in terms of the population as well as their data collection methods, since an assessment of HWs during the emergency situation of the COVID-19 pandemic was attempted to provide a quick "snapshot" of the knowledge and perceptions of HWs during the emergency situation of the COVID-19 pandemic.

All the studies made use of the cross-sectional approach to formulate their research hypothesis, although no such limitation had been imposed on the methodological design during the selection process. This is due to the purpose of the studies since they attempted to provide a quick "snapshot" of the knowledge and perceptions of HWs during the emergency situation of the COVID-19 pandemic.

Cohort and Cross-Sectional Studies (NIH, 2014). Each study was assessed using the options (a) Good (b) Fair or (c) Poor, based on the following six types: (a) design, (b) selection bias, (c) data collection, (d) confounding factors, (e) blinding and (f) attrition. The assessment was carried out by two independent researchers (G.P. and Z.R) while disagreements were resolved through discussion. Regarding the interpretation of the results, standardized tables were used along with a narrative description to reach an overall systematic assessment of the quality of the studies.

2.7 Synthesis of results

The synthesis of the findings appears in text and tables. The narrative approach was employed as far as the results are concerned, because the studies, apart from their design, were heterogeneous in terms of the population as well as their data collection methods, since an improvised scale was used in all of them (the questionnaire was designated by the authors).

3 RESULTS

The search has yielded nine articles to be analyzed (Figure 1). The studies appear to have been conducted mainly in the Asian continent. Specifically, apart from a study Bhagavathula et al. (2020), which collected information on a global scale, the participants of the remaining studies were located in Vietnam (Giao et al., 2020), China (Shi et al., 2020; Zhou et al., 2020), Iran (Maleki et al., 2020; Nemati et al., 2020; Taghrir et al., 2020), India (Modi et al., 2020) and Pakistan (Saqlain et al., 2020).

| Table 1 | Search strategy example |
|---------|------------------------|
| Search  | Esbcio search strategy | Query | Results |
| #1      | SU attitudes OR SU knowledge OR SU practice | 6,672 |
| #2      | TI ("attitude" OR "perce" OR "opinion" OR "thought" OR "feeling" OR "experien:" OR "view" OR "reflection" OR "belief" OR "perspective" OR "awareness" OR "anxiety" OR "knowledge" OR "practic" OR "education" OR "understand" OR "awareness" OR "consideret" OR "mentality" OR "mindset" OR "behavo" OR "placement" OR "position" OR "concept" OR "gasp" OR "insight") OR AB ("attitude" OR "perce" OR "opinion" OR "thought" OR "feeling" OR "experien:" OR "view" OR "reflection" OR "belief" OR "perspective" OR "awareness" OR "anxiety" OR "knowledge" OR "practic" OR "education" OR "understand" OR "awareness"
OR "consideret" OR "mentality" OR "mindset" OR "behavo" OR "placement" OR "position" OR "concept" OR "gasp" OR "insight") | 43,247 |
| #3      | #1 OR #2 | 44,422 |
| #4      | SU COVID-19 OR SU pandemics | 1,468 |
| #5      | TI ("corona-virus" OR "corona virus" OR "corona virus" OR "covid-19" OR "covid-19" OR "2019-ncov" OR "2019ncov" OR "2019-ncov" OR "2019ncov" OR "sars-cov-2" OR "sars-cov2" OR "sarscov2" OR "sarscov2" OR "SARS-CoV" OR "pandemi" OR "epidemi" OR "outbreak" OR "diseas" OR "glycoprotein" OR "glycosylation") OR AB ("corona-virus" OR "corona virus" OR "corona virus" OR "covid-19" OR "covid-19" OR "2019-ncov" OR "2019ncov" OR "2019-ncov" OR "2019ncov" OR "sars-cov-2" OR "sars-cov2" OR "sarscov2" OR "sarscov2" OR "SARS-CoV" OR "pandemi" OR "epidemi" OR "outbreak" OR "diseas" OR "glycoprotein" OR "glycosylation") | 807,634 |
| #6      | #4 OR #5 | 807,634 |
| #7      | SU medical staff OR SU health personnel OR SU MEDICAL personnel OR SU nursing staff | 131,105 |
| #8      | TI ("physician" OR "doctor" OR "clinician" OR "nurs" OR "paramedic" OR "medical worker" OR "healthcare provider" OR "healthcare professional") OR AB ("physician" OR "doctor" OR "clinician" OR "nurs" OR "paramedic" OR "medical worker" OR "healthcare provider" OR "healthcare professional") | 877,062 |
| #9      | #7 OR #8 | 877,062 |
| #10     | #3 AND #6 AND #9 AND limiters: Peer reviewed, date Published 202000101-202000430, English | 1,090 |

*expand search.
January 2020 and April 2020, which according to WHO (2020) was a period during which there was an outbreak of the virus.

The researchers of these studies prefer to gather their data online since only two used printed means to collect data (Giao et al., 2020; Maleki et al., 2020) and, as is evident from the studies, this is due to the reduction of exposure to the virus. Finally, two of the studies (Giao et al., 2020; Maleki et al., 2020) used random sampling, another study (Zhou et al., 2020) used cluster sampling, while the rest of the studies used convenience sampling. All studies used questionnaires designated by authors, which were either based on previous studies dealing with a similar coronavirus (MERs CoV) or webpages of international organisations (WHO, CDC, NIH), and which constituted a limitation during the comparison of the results.

### 3.1 | HWs’ knowledge and attitude during COVID-19

Apart from the results of two studies (Bhagavathula et al., 2020; Nemati et al., 2020) that indicated moderate percentage levels regarding the participants’ overall knowledge, the remaining seven studies report high percentages. In fact, in a study by Maleki et al. (2020), the HWs’ level of knowledge was found to be excellent as far as the transmission modes of the virus are concerned (99%). However, the same study concluded that there was a significant statistical difference ($p < .001$) regarding the participants’ knowledge and attitude regarding the asymptomatic carriers since some of the participants held the belief that protective and preventative measures should only
| Study | Sample size | Sample characteristics | Outcome measure(s) | Findings/results |
|-------|-------------|------------------------|--------------------|------------------|
| Giao et al. (2020), Vietnam, cross-sectional | n = 327 | M (26.0) Gender (%): 5 (62.9%) Year of experience: Mean ± SD: 30.1 ± 6.1 | SAQ/based on previous study and according to WHO information's | 82.3% believe that they are likely to become sick. 79.8 are worried that a member of their family will become infected. A good level of knowledge and positive attitude were found. Average knowledge score 8.17 ± 1.3 (4–10). Average attitude 1.86 ± 0.43 (1–5). There was a negative correlation between the scores of knowledge and the scores of attitudes (r = −0.21, p < .001). Additional educational interventions are required for healthcare workers. |
| Shi et al. (2020), China, cross-sectional | n = 311 | M (48.23) Gender (%): 5–10 (30.8%) Year of experience: Mean ± SD: 17.25 ± 2.06 | SAQ/based on previous study | 77.17% expressed willingness to take care of psychiatric patients suffering from COVID-19. The most common reasons for the percentages that expressed unwillingness were concern regarding the transmission of the virus to family members (53.09%) as well as themselves (48.67%). 89.51% of the participants’ knowledge about the virus was good. More attention should be paid to the knowledge and attitudes of the medical staff of psychiatric hospitals. Advanced training, the experience of treating patients with COVID-19 and a good knowledge of the dangers and ways of protection were found to be independent variables related to a high possibility of acceptance of taking care of patients COVID-19. |
| Zhou et al. (2020), China, cross-sectional | n = 1,357 | M (53.35) Gender (%): 5 (33.9%) Year of experience: Mean ± SD: 33.74 ± 8.08 | SAQ | 85% of the participants are afraid they will be infected during work. 89% had a good level of knowledge regarding COVID-19. 89.7% believe that they employ appropriate practices in relation to the virus. Apart from the level of knowledge which affects HWs’ attitude and practice, other risk factors include work experience and occupation. Doctors feel more (Continues) |
tired during the pandemic compared to paramedical staff ($H = 0.438, 95\% CI: 0.256, 0.748$). HWs with 5–9 years of experience were found to be less likely to feel tired ($0.639, 95\% CI: 0.429, 0.950$), thus proving that this group had a particular ability and experience regarding dealing with public health emergencies. Compared to front line health care professionals the non-front-line workers were less confident about the defeat of the virus ($H = 0.562, 95\% CI: 0.376, 0.839$). This optimism exhibited by front-line health care workers may be associated with the support practices provided by the country (strong material support and care), and therefore they may be more confident about their ability to defeat the virus. Measures must be taken for the protection of HWs.

Most of the participants had a positive outlook regarding averting and controlling COVID-19. A significant percentage of HWs had inadequate knowledge about the ways the virus is transmitted (61%) as well as the onset of symptoms (63.6%). Factors such as age and occupation were associated with inadequate knowledge and negative perception regarding COVID-19. Most of the participants used social media to obtain information (61%). Educational interventions and further training are required.
| Study                              | Sample size | Gender (%) | Year of experience | Age          | Occupation (%) | Outcome measure(s)                  | Findings/results                                                                                                                                 |
|-----------------------------------|-------------|------------|--------------------|--------------|----------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Nemati et al. (2020), Iran, cross-sectional | n = 85      | M (14.1)   | <5 (41.2%)         | <40 (75.3%)  | Nu (100)       | SAQ/according to WHO information's  | The average score with respect to the participants concern about disease caused by COVID-19 was 6.02 ± 2.6 (1–10) while worry regarding the possibility that a member of their family might become sick was 6.87 ± 2.8 (1–10). More than half of the participants (56.5%) had a good level of knowledge with respect to transmission, symptoms, indications, prognosis, treatment and mortality rate of COVID-19. The sources of information of the participants were (55.29%) the WHO, the Ministry of Health, (48.23%) social media (42.35%) and mass media. More information should be provided to nurses for better control. |
| Modi et al. (2020), India (Mumbai), cross-sectional | n = 1,562   | M (24.1)   | —                  | 18–30 (88.1%)| AHS (9)        | SAQ/according to WHO and CDC information's | Overall awareness was adequate with 71.2% reporting correct answers. The highest percentage of correct answers belonged to undergraduate medical students while the lowest ones were from non-clinical administrative personnel. Fewer than half of the respondents were able to correctly define the concept “close contact.” More than three quarters of respondents knew the various measures for infection control. Nevertheless, only 45.4% of respondents knew the correct order of the actions required to put on a protective mask, and only 52.5% of respondents were aware of the preferred method of hand hygiene for visibly dirty hands. There is a need for regular educational interventions and training programmes. |
| Study | Sample size | Gender (%) | Year of experience | Age | Occupation (%) | Outcome measure(s) | Findings/results |
|-------|-------------|------------|--------------------|-----|----------------|-------------------|------------------|
| Taghrir, Borazjani, and Shiraly (2020), Iran, cross-sectional | n = 240 | M (40.8) | Stager (5th–6th medical student) (70%) | Mean ± SD: 23.67 ± 1.57 | Front-line MS (100) | SAQ/based on previous study | A medium perception of risk was found. The average percentage of correct answers with regard to knowledge was 86.96%. The average percentage of preventative behaviours was 94.47%. A high level of the relevant knowledge as well as preventative behaviours was found, but a medium perception of risk. Despite a self-reported high level of preventive behaviours, a medium perception of risk among medical students may cause concern with respect to their protection behaviour. As a vulnerable group, they need to take the matter more seriously. The negative correlation between preventative behaviours and perception of risk was the most interesting finding in this study. |
| Maleki, Najafi, Farhadi, et al. (2020), Iran, cross-sectional | n = 191 | M (38.2) | 0–5 (44.5%) | Mean ± SD: 34.7 ± 8.6 | Phy (15.7) | SAQ/based on previous study | 92.1% of the participants reported that they were afraid that the virus would be transmitted to their family, while 77% are scared that they will become infected with the virus. As far as the modes of transmission are concerned, the participants' level of knowledge was very high (99%). Overall, despite the fact that the levels of knowledge, appropriate attitude and behaviour of the participants in respect of COVID-19 were found to be high, the treatment of asymptomatic patients was inadequate. Depending on their professional position, the participants exhibited significant differences in their knowledge in relation to asymptomatic patients (p < .001). There was a significant difference in the behaviour and preventative measures among the participants when they treated patients with serious COVID-19 symptoms and without any... |
| Study                                      | Sample size | Sample characteristics | Occupation (%) | Outcome measure(s) | Findings/results                                                                 |
|-------------------------------------------|-------------|------------------------|----------------|-------------------|------------------------------------------------------------------------------------|
| Saqlain et al. (2020), Pakistan, cross-sectional  | n = 414  | 5–10 (7.8%) F (61.8)  | Nu (34)        | SAQ/according to WHO and NIH information's | COVID-19 symptoms ($p = .05$). Additional training of HWs is required in respect of asymptomatic cases for their protection from infection and prevention of transmitting the disease to their colleagues and other patients. |
|                                           | M (50.5) | <1 (26.6%)             | Phy (29.98)    |                   | The findings showed that the participants had a good level of knowledge (93.2%), positive attitude (8.43 ± 1.78) and appropriate practice (88.7%). The participants believe that overcrowding in emergency rooms (52.9%), limited infection control material (50.7%) and poor knowledge regarding transmission (40.6%) are the main obstacles to the objective practice of infection control. The participants most widely used source of information was social media. Well-structured educational programmes are recommended for the effective control of the spread of the virus. |
|                                           |            | 1–3 (31.6%) 10–15 (21.4%) | Pha (46.65)    |                   |                                                                                   |
|                                           |            | >5 (28.3%)             | Nu (25.36)     |                   |                                                                                   |

Abbreviations: AHS, allied health sciences; CDC, Center for Disease Control and Prevention; D, dentists; F, female; LT, lab technicians; M, male; MA, medical academicians; MP-G, medical post-graduates; MS, medical students; N-CS, non-clinical staff; NIH, National Institutes of Health; Nu, nurses; P/OT, physiotherapy/occupational therapy; Para, paramedics; Pha, pharmacists; Phy, physicians; R, radiologists; SAQ, Self-Administered Questionnaire; TS, technical staff; WHO, World Health Organization.
be applied when managing individuals presenting serious symptoms. CDC (2020) adds to the previous comment that asymptomatic carriers also play an important role in the spread of COVID-19.

Another study (Modi et al., 2020), which also concluded that the participants’ overall knowledge is high (71.2%), specifies that the highest percentage of correct answers belonged to undergraduate medical students, while the lowest ones were from non-clinical administrative personnel. The same study also reports that fewer than half of the respondents were able to correctly define the concept “close contact” as well as the correct sequence of actions required to put on a mask.

The results of several studies (Maleki et al., 2020; Modi et al., 2020; Shi et al., 2020; Zhou et al., 2020) indicated that specific demographic characteristics may affect both the knowledge as well as the attitudes of HWs. In the study by Bhagavathula et al. (2020), there appears to be a correlation between certain demographic characteristics (age and occupation) and both inadequate knowledge and negative attitude towards the virus. The study by Zhou et al. (2020) agrees with the previous comment since it has concluded that similar variables (work experience and occupation) affect HWs’, while it adds that HWs’ knowledge level also influences their attitudes and practice. It is worth noting that, according to the same study, the Medical Staff felt more tired during the pandemic, compared to paramedical staff (H = 0.438, 95% CI: 0.256, 0.748), since even HWs with 5–9 years of experience were found to be less likely to feel tired (0.639, 95% CI: 0.429, 0.950), thus proving that this group was particularly able and experienced in dealing with Public Health emergencies. The study by Giao et al. (2020) summarises the findings of the previous authors since it indicated the negative correlation between the knowledge scores and the perception scores ($r = -0.21, p < .001$).

Finally, three of the studies (Bhagavathula et al., 2020; Saqlain et al., 2020; Nemati et al., 2020) assessed the sources of information the HWs used regarding COVID-19. Two of them (Bhagavathula et al., 2020; Saqlain et al., 2020) agreed that social media was the most frequently used source of information, while the study by Nemati et al. (2020) has found them to be second in HWs’ preferences since, in the above mentioned study, official websites appeared to rank higher (WHO, CDC, etc.).

Six out of the nine studies investigated a specific field of HWs’ perception related to their opinion about the risk of the virus. Apart from a study by Taghir et al. (2020), which stated that the participants had a moderate perception of risk (2.04 ± 0.97, 1–4), all the other studies that investigated this issue (Giao et al., 2020; Shi et al., 2020; Zhou et al., 2020; Bhagavathula et al., 2020; Maleki et al., 2020) found high percentages of risk perception. For example, the study by Giao et al. (2020) indicated that 82.3% of HWs held the belief that they would probably become sick with the virus, while the study by Maleki et al. (2020) reached the conclusion that 92.1% of the participants expressed the fear that the virus would be transmitted to their family. In the study by Bhagavathula et al. (2020), the researchers investigated the knowledge and perceptions of HWs using an international online questionnaire and concluded that they were optimistic regarding the defeat of the virus.

### 4 | DISCUSSION

The purpose of this systematic review was to investigate HWs’ knowledge and their perception of the risk of COVID-19 spread during the pandemic. The period of time devoted to collecting data related to the studies examined lasted from January 2020 to April 2020, which, according to WHO (2020), was a time during which there was an outbreak of the virus. The participants of the studies were mainly located in the Asian continent, a fact which creates a research gap as far as the rest of the population is concerned.

A limitation has been located in the existing literature regarding measurement tools, since all studies made use of questionnaires designated by authors that were created based on previous studies or that focused on a similar coronavirus (MERs CoV) or on data collected from international health organizations (WHO, CDC, NIH) websites. Therefore, this imposes an important limitation on the systematic comparison of the results. The research community should display an interest in the development of standardized questionnaires, which can be used in similar future emergency situations of any infectious disease’s spread.

Studies show that HWs’ level of knowledge appears to range from high ($n = 7$, min = 93.2%) to moderate quantitative levels ($n = 2$, min = 56.5%). HWs appear to excel in specific fields of knowledge, such as the ways that the virus is transmitted, while there seems to be room for improvement regarding preventative behaviors.

HWs’ attitudes towards the risk of the virus appear to be quite satisfactory since all the studies, except one (min = 56.5%), which focused on this issue agree on high perception ($n = 5$, max 92.1%). Aoyagi, Beck, Dingwall, and Nguyen-Van-Tam (2015) add that the perception of danger has been proven to directly affect HWs’ willingness to work during a pandemic.

Demographic characteristics, such as occupation, age, and HWs’ years of experience, appear to directly affect their knowledge and perceptions in most studies ($n = 5$). Therefore, more emphasis must be placed on the abovementioned demographics during educational interventions. Moreover, all the studies, without any exception, recommend the use of additional educational interventions for HWs.

Finally, it was recognized by certain studies ($n = 3$) that the most widely used source of information was social media followed by official health websites. According to a systematic review by Aoyagi et al. (2015), information must be readily available and frequently reviewed so that the organizational readiness of the information sources may contribute to the development of trust of HWs regarding their exposure to danger.

The purpose of each study is clearly stated but methodological quality generally ranged from average to poor (Table 3). Cross-sectional studies are weak in the following areas: (a) Selection bias, (b) information bias, and (c) confounding bias (Pandis, 2014).

The increased need for international literature to obtain findings immediately (WHO, 2020), and given that their knowledge is of high significance regarding the prevention and control of the spread of the COVID-19 disease (McEachan et al., 2016), most authors employed quick data collection methods. Specifically, six studies (Shi et al., 2020; Bhagavathula et al., 2020; Nemati et al., 2020; Modi...
et al., 2020; Taghrir et al., 2020; Saqlain et al., 2020) used convenience sampling for the collection of data, a fact which increases selection bias (Etikan, 2016). Selection bias also increases in most of the studies with the exception of the one conducted by Giao et al. (2020) and Maleki et al. (2020) since data collection was realized via the Internet (Greenacre, 2016).

Since that data collection was realized with the use of self-report questionnaires in all the studies, the likelihood of information bias is probably increased (Pandis, 2014). Two studies (Maleki et al., 2020; Nemati et al., 2020) do not present the necessary documentation for the desired number of representative sample and, besides that, the size of the sample they eventually examined may be considered small. The quality of these two studies has been rated as poor since very small samples undermine the internal and external validity of a study and prevent the generalisation of their results (Faber & Fonseca, 2014).

| Authors and year of publication | Quality rating | Quality appraisal findings |
|---------------------------------|---------------|--------------------------|
| Giao et al. (2020)              | Good          | Cross-sectional design   |
|                                 |               | Self-report questionnaire and designated by authors |
| Shi et al. (2020)               | Fair          | Cross-sectional design   |
|                                 |               | Self-report questionnaire and designated by authors |
|                                 |               | Convenience sample       |
| Zhou et al. (2020)              | Fair          | Cross-sectional design   |
|                                 |               | Demographic data missing (age) |
|                                 |               | Self-report questionnaire and designated by authors |
|                                 |               | Online survey            |
| Bhagavathula et al. (2020)     | Fair          | Cross-sectional design   |
|                                 |               | Demographic data missing (years of experience) |
|                                 |               | Self-report questionnaire and designated by authors |
|                                 |               | Online survey            |
| Nemati et al. (2020)            | Poor          | Cross-sectional design   |
|                                 |               | Small sample size <100   |
|                                 |               | Self-report questionnaire and designated by authors |
|                                 |               | Convenience sample       |
|                                 |               | Online survey            |
| Modi et al. (2020)              | Fair          | Cross-sectional design   |
|                                 |               | Demographic data missing (years of experience) |
|                                 |               | Self-report questionnaire and designated by authors |
|                                 |               | Convenience sample       |
|                                 |               | Online survey            |
| Taghrir et al. (2020)           | Fair          | Cross-sectional design   |
|                                 |               | Self-report questionnaire and designated by authors |
|                                 |               | Convenience sample       |
|                                 |               | Online survey            |
| Maleki et al. (2020)            | Poor          | Cross-sectional design   |
|                                 |               | Small sample size <200   |
|                                 |               | Self-report questionnaire and designated by authors |
|                                 |               | Sample size not justified |
| Saqlain et al. (2020)           | Fair          | Cross-sectional design   |
|                                 |               | Self-report questionnaire and designated by authors |
|                                 |               | Convenience sample       |
|                                 |               | Online survey            |
4.1 | Limitations

Although the results of this systematic review may contribute to the enrichment of the existing literature, they still need to be recognized, and the study’s limitations should be taken into consideration in order for it to contribute to the progress of future research.

First of all, due to the fact that all the studies included were cross-sectional, the cause of the findings cannot be examined; only a systematic snapshot of HWs’ knowledge and perception in an emergency spread of COVID-19 pandemic may be provided. In addition, the low number of studies that fulfilled the inclusion criteria of this study prevents further examination of relevant parameters of this issue.

Most of the studies used convenience sampling to collect data, which increases selection bias. Selection bias is also increased in most studies since data collection was realized via the Internet. Due to the fact that data collection was realized with the use of self-report questionnaires in all the studies, the likelihood of Information bias is probably increased. All the bias errors that have been recognized constitute important factors that should make one cautious regarding the generalization of the results.

5 | CONCLUSIONS

The findings of this study indicate that HWs had a satisfactory perception of risk during the COVID-19 spread. Even though fields with medium knowledge levels were recognized, HWs’ overall knowledge may also be characterized as satisfactory. It is also noted that specific demographic characteristics (occupation, age, and years of experience) seem to affect HWs’ knowledge and perceptions. The studies’ population was mainly located in the Asian continent, a fact which leaves a research gap regarding the rest of the population.

To summarise, this study highlights the need for adequate knowledge of HWs in the case of an emergency pandemic like COVID-19. The implementation of educational strategies, which aim to continually support HWs in terms of information and knowledge, available so far, about the virus, as well as protection measures and measures for the prevention of the spread of the virus on an individual as well as a collective level, is unanimously recommended by the studies because the people’s-patients’ life is our first concern in this area. Also, to help the sick, the people whose duty is to take care of them must be healthy.

AUTHOR CONTRIBUTIONS

All authors contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

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