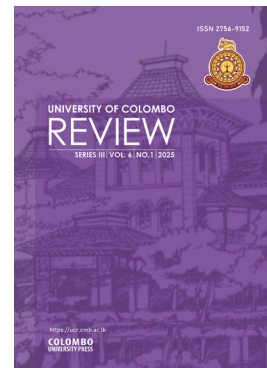


DOI: <https://doi.org/10.4038/ucr.v6i1.178>

University of Colombo Review (Series III),
Vol.6, No.1, 2025



Nursing students' challenges and perceptions of COVID-19 and readiness for future pandemics

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ABSTRACT

Global healthcare services faced unprecedented challenges in patient care and resource management in responding to COVID-19. Nursing students, forced to adapt to healthcare needs, underwent a transformative journey, marking a significant evolution in their education and profession. This study aims to identify and synthesize available evidence on nursing students' challenges, and perceptions of COVID-19 and to determine readiness for future pandemics. From June 2021 to September 2023, a rapid literature review explored Google Scholar, Science Direct, and PubMed, identifying publications between 2019 and 2023 using the search terms "COVID-19", "Nursing students", "Teaching", "Readiness" and "Future". The findings on challenges and perceptions were categorized based on the ecological model of Bronfenbrenner and nursing students' learning and teaching readiness for future pandemics were analyzed. Thirty-nine articles were eligible from 6890 studies. When arranging evidence into levels, the intrapersonal level includes knowledge, health distress, experiences, skills, and attitudes. Family burden and teamwork are classified at the interpersonal level, and the institutional level includes classroom and clinical learning. Social relationships and policy developments are classified at community and public policy levels. Readiness for future pandemics will safeguard the integrity and safety of patients and equip nursing graduates with the essential competencies required for healthcare challenges. Nursing students are expected to be confident and responsible in implementing decisions in future pandemics. Nursing administration and faculties are recommended to prioritize educational excellence, innovation, and adaptability for future pandemic readiness. Incorporating crisis plans, transparent communication, and coping strategies into the nursing curriculum supports students' academic and emotional adjustment.

KEYWORDS:

Nursing students, COVID-19 pandemic, Challenges, Perceptions, Readiness

Suggested Citation: Nishara, M.G.S., Asurakkody, T. A., Herath, H.M.H. I, Shavindi, J. M. L. & Lakrandi, P.P.M. (2025). Nursing students' challenges and perceptions of COVID-19 and readiness for future pandemics. *University of Colombo Review* (New Series III), 6(1),84-114.

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Introduction

The COVID-19 pandemic which originated in China is known to be the most devastating pandemic that the world encountered in the 21st century. The highly contagious nature of the coronavirus led to its rapid transmission among people. The fight against the coronavirus is ongoing across the globe affecting people with more than 771,679,618 confirmed cases including 6,977,023 deaths according to the World Health Organization (WHO) records up to the 2nd of November, 2023 (WHO, 2023). Due to the deleterious nature of the virus, governments began to order lockdowns to slow the spread of COVID-19 (Konrad et al., 2020; Wallace et al., 2021).

The rapid transmission of the coronavirus changed the ability of governments and health authorities to adequately inform the public about the risks involved and the precautions required (Ding et al., 2020). The actions adopted to reduce the spread of the pandemic were justifiable. However, the actions had different impacts on the global population such as mental, physical, economic, and political effects (Awoke et al., 2021; Grande et al., 2021). The global impact of the COVID-19 pandemic led to widespread disruptions in services throughout the world. This included the implementation of lockdowns, a transition of education to online platforms, and the adoption of technology-driven methods to enhance teaching and learning processes (Egilsdottir et al., 2022).

The health sector had unachievable demands placed on it due to the rapid transmission of the disease and health workers had to ensure that requisite material and human resources were made available (Mena-Tudela et al., 2021). The heavy workload on the healthcare workers, especially nurses and physicians on the frontline agitated their physical and mental health (Crismon et al., 2021). With the initiation of the pandemic period, nursing students have been frequently subjected to personal and clinical stressors (Li & Hasson, 2020). The high-intensity workloads have created a competitive and stressful learning environment (Drach-Zahavy et al., 2021). The WHO, in 2020 has stated that nurses have always been at the forefront of the global fight against health-threatening epidemics and pandemics (Casafont et al., 2021).

Lack of staff during the COVID-19 pandemic increased the level of anxiety and stress in nursing students (Hernández-Martínez et al., 2021). Numerous studies have been conducted worldwide to assess the psychological stress among student nurses during the prevailing COVID-19 pandemic (Martin-Delgado et al., 2021, 2021; Sümen & Adıbelli, 2021; Sun et al., 2020).

Cheah et al. (2021) have found that although the willingness and commitment of medical and nursing students to work during the COVID-19 pandemic were high, students tended to neglect the importance of taking risks as future healthcare workers. Cheah et al., (2021) stated that students need to learn about self-responsibility and be ready in case a new disease emerges shortly and students should be exposed to a hospital setting by bringing in more clinical teachings for future preparation.

Final-year nursing students had positive attitudes towards the pandemic, and they expressed a strong willingness to work during the crisis. In fact, they voluntarily joined the healthcare workforce as auxiliary staff (Martin-Delgado et al., 2021).

The education sector was hugely affected due to the global pandemic (Gaur et al., 2020; Wallace et al., 2021). Clinical practices and in-person experiences were limited by the crisis (Michel et al., 2021; Jackman et al., 2020). Face-to-face classroom learning was shifted to an online learning method (Soriano & Oducado, 2021). The pandemic has been a turning point in the application of virtual simulations in nursing education, which overcame a barrier to training students safely in hospitals and paved the way to continue education during the pandemic (Kim et al., 2021).

Although there are numerous qualitative and quantitative studies focused on nursing students relative to COVID-19, there are no specific studies on the nursing students' challenges and perceptions of the impact of the COVID-19 pandemic and teaching and learning readiness for future pandemics.

Accordingly, an overview of the research conducted to date could be a useful guide for future student nurses. It would also identify areas in which further studies are needed to improve nursing students' ability to respond to public health emergencies. The aim of the study was to conduct a comprehensive systematic overview of the literature to identify and synthesize available evidence on nursing students' challenges and perceptions of COVID-19 and to identify readiness for future pandemics. Findings of the systemic overview have been categorized under the ecological model which was developed by Bronfenbrenner in 1970. Nursing students' learning and teaching readiness for future pandemics have been analyzed.

Method

Design

The study was conducted by review of the literature systematically.

Search Strategy

A rapid review was conducted by a comprehensive search of electronic databases, Google Scholar, Science Direct, and PubMed. The search terms used were a combination of keywords "COVID-19, "Nursing students", "Teaching", "Readiness" and "Future".

Inclusion Criteria

Studies published between 2019 and 2023 written in English, focusing on the impact of the COVID-19 pandemic on nursing students and their teaching and learning readiness for future pandemics have been included in the present review.

Exclusion Criteria

Studies not directly related to pandemics, nursing staff, another student category, future pandemic readiness, articles written in another language, and editorials were excluded.

Data extraction, analysis, and synthesis of results

Five independent reviewers screened titles and abstracts to select relevant articles based on the inclusion and exclusion criteria. Disagreements were resolved through consensus. Relevant data from selected studies, including study design, participants, ethical challenges, and readiness for the future were extracted.

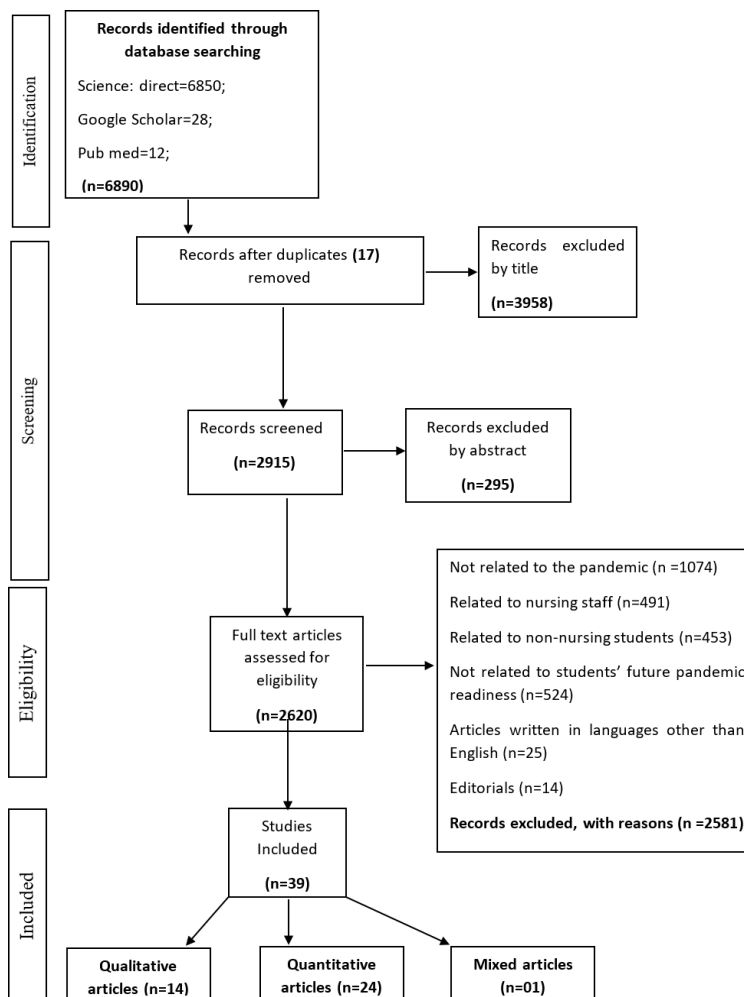


Figure 1: PRISMA flow chart indicating study selection process

Findings

Findings were categorized under the ecological model which was developed by Bronfenbrenner in 1970 (Bronfenbrenner, 1970). It consists of five levels (1) intrapersonal factors, (2) interpersonal factors, (3) institutional and organizational factors, (4) community factors, and (5) public policy factors. Nursing students' learning and teaching readiness for future pandemics were also analyzed.

Intrapersonal level

The intrapersonal level consists of factors that infuse individual behavior. Psychological and physiological distress of nursing students during COVID-19, knowledge and prevention of COVID-19, experience regarding the COVID-19 pandemic, and attitude towards the pandemic were included.

Psychological and physiological distress of nursing students during COVID-19

During the COVID-19 period, nurses experienced higher psychological stress than student nurses, due to the working environment (Sümen & Adibelli, 2021). Sun et al. (2020) have found that the level of anxiety fluctuated with student nurses' academic year and clinical practices during the COVID-19 pandemic (Aslan & Pekince, 2020; Sheroun et al., 2020; Eweida et al., 2020). Fourth year nursing students reported significantly higher resilience than more junior students (Drach-Zahavy et al., 2021). Psychological preparation of nursing students was inadequate to deal with critical situations (Eweida et al., 2020). Becoming infected was identified as the major factor that enhanced the fear of students (Savitsky et al., 2020; Aslan & Pekince, 2020; Manning et al., 2021; Lovrić et al., 2020; Ulenaers et al., 2021; Mena-Tudela et al., 2021; Eweida et al., 2020; Collado-Boira et al., 2020).

Several studies stated that lack of transportation, scarcity of Personal Protective Equipment (PPE), financial issues, relocation, workload, and isolation were factors that enhanced the stress level in the clinical setting (Jackman et al., Michel et al., 2021 2020; Sheroun et al., 2020; Martin-Delgado et al., 2021; Collado-Boira et al., 2020; Ulenaers et al., 2021). According to the study by Hernández, students refused to work in hospitals due to fear of being a vector of COVID-19 to the family (Hernández-Martínez et al., 2021). Being unprepared for work also made the students refuse to work in hospitals during the COVID-19 pandemic (Hernández-Martínez et al., 2021). Students developed anxiety and nervousness because of not being volunteers (Hernández-Martínez et al., 2021).

Most nursing students felt uncertain about their online education, training, future education plans, and financial stability during the COVID-19 pandemic (Savitsky et al., 2020; Awoke et al., 2021; Nodine et al., 2021; Gómez-Ibáñez et al., 2020; Michel et al., 2021; Jackman et al., 2020; Crismon et al., 2021; Drach-

Zahavy et al., 2021; Casafont et al., 2021). During the COVID-19 outbreak, nursing students' professional identity was increased (Zhao et al., 2021). Zhang et al. (2021) stated that the development of professional identity assists with use of PPE for physical protection, coping with stress, career planning and to adapt to the new workplace environment for students in the COVID-19 pandemic.

The majority of students have experienced adverse consequences as a result of online classes (Singh et al., 2021). Loss of concentration was identified as the most common problem (Singh, 2021). Eye strain, sleep disturbance, neck pain, back pain, and headaches were also reported by students (Singh, 2021). In the clinical setting, wearing PPE for a long time and inadequate sleep hygiene increased the physical discomfort of nursing students (Sümen & Adibelli, 2021; Brouwer et al., 2021; Eweida et al., 2020). Students were exhausted and distressed from working full days in clinical settings (Casafont et al., 2021).

Knowledge and prevention of COVID-19

Several studies have reported that nursing students have adequate awareness and preventive behaviors relating to COVID-19 (Gohel et al., 2020; Ulenaers et al., 2021; Albaqawi et al., 2020; Sümen & Adibelli, 2021; Sun et al., 2020; Begum, 2020). Many students have mentioned their lack of knowledge and awareness regarding infection control and prevention, as well as the usage of PPE, and some nursing students noted discrepancies in other professionals' clinical practice (Collado-Boira et al., 2020; Martin-Delgado et al., 2021).

The majority of students preferred to follow WHO-recommended methods for preventing COVID-19 (Gohel et al., 2020; Ulenaers et al., 2021; Sun et al., 2020; Tang et al., 2021; Awoke et al., 2021; Begum, 2020; Lovrić et al., 2020). Furthermore, students emphasized that they follow general prevention protocols and consider wearing masks, gloves, and proper hand hygiene methods (Ulenaers et al., 2021). In addition, students were able to apply their knowledge in practice by working with professionals (Canet-Vélez et al., 2021).

Experience

Students indicated that their perception of their experience depends on the unit they are assigned to (Canet-Vélez et al., 2021). Students who were assigned to the COVID units had a higher risk of infection, feeling of unpreparedness, and showed greater fear compared to students assigned to non-COVID units (Canet-Vélez et al., 2021; Collado-Boira et al., 2021; Nodine et al., 2021).

Nursing students experienced a lack of PPE in clinical settings (Savitsky et al., 2020; Martin-Delgado et al., 2021; Collado-Boira et al., 2021). Practice sessions were conducted to educate nursing students on wearing PPE, caring for patients with ventilators, and on how to interact with patients who are infected with COVID-19 (Martin-Delgado et al., 2021). Students reported exhaustion due to continuous working shifts (Canet-Vélez et al., 2021).

Nursing students reported that the clinical experience during the pandemic was significant and helped them understand the true nature of their intended careers and increased their professional identity (Michel et al., 2021; Crismon et al., 2021; Zhang et al., 2021; Sun et al., 2020; Gómez-Ibáñez et al., 2020). Reflective journals written by nursing students in Spain about their experience and commitment towards the COVID-19 pandemic revealed the difficulty in working on the front line in battling COVID-19, methods for enhancing self-assurance, managing individual emotions, and adopting innovative approaches to patient care (Martin-Delgado et al., 2021). Inexperienced registered nurses who have recently graduated and accrued less than one year of professional experience were found to be responsible for medical errors due to limited exposure to clinical practice, resulting from the imposition of lockdown measures (Song & Kim, 2023).

Attitudes

Kim et al. (2021) stated that nursing students were able to care for a patient from admission to discharge through the use of virtual simulations during the COVID-19 pandemic. Participants were confident in performing a comprehensive assessment and able to perform most of the procedures by themselves, involving highly risky and rare procedures, the ability to provide emergency care, and the ability to observe the patients more closely (Kim et al., 2021). It has been identified that virtual simulations were used as an alternative to clinical practice during the pandemic in South Korea (Kim et al., 2021).

Many participants expressed admiration and pride in being nurses, clarifying that the pandemic had strengthened their self-esteem in the profession (Crismon et al., 2021). Although displaying ambivalent attitudes towards the possibility of contracting an infection, students had identified the responsibility of the nursing profession towards the community and also towards their family, especially in a crisis (Lovrić et al., 2020; Wallace et al., 2021).

The majority of students believed that precautional practices reduce the rate of transmission of the COVID-19 virus (Gohel et al., 2020). Students presented readiness to vaccinate due to concerns of personal safety and safety of family members (Manning et al., 2021).

Interpersonal level

The interpersonal level focuses on relationships with family, peers and friends that influence student nurses' behavior and development. This level consists of analyses of family burden and teamwork.

Family burden

Family support is an effective coping strategy for both students and healthcare workers after a traumatic experience and in order to accomplish a healthy transformation to a life after the trauma they have experienced (Casafont et al., 2021). The possibility of getting infected and being vectors of the disease were major concerns that aggravated the fear of students during the pandemic period (Collado-Boira et al., 2021; Mena-Tudela et al., 2021; Gómez-Ibáñez et al., 2020; Manning et al., 2021; Lovrić et al., 2020; Sümen & Adıbelli, 2021; Ulenaers et al., 2021; Eweida et al., 2020; Awoke et al., 2021; Drach-Zahavy et al., 2021; Martin-Delgado et al., 2021; Casafont et al., 2021). Financial decline of the family during the pandemic forced the students to be involved in clinical practice despite the fear of being victims of the virus (Eweida et al., 2020; Hernández-Martínez et al., 2021). This was one of the factors that led to the involuntary participation of nursing students in providing healthcare assistance to healthcare professionals during the pandemic (Eweida et al., 2020; Hernández-Martínez et al., 2021).

Students had to separate from their families to safeguard them from the COVID-19 virus (Gómez-Ibáñez et al., 2020). For families with limited income, purchasing technical devices and obtaining internet facilities for continuing education during the pandemic was demanding (Bdair, 2021; Wallace et al., 2021). Families had to take the responsibility of childrens' education as schools were closed (Bdair, 2021; Wallace et al., 2021). Families had to adapt to new family dynamics of work from home schedules (Bdair, 2021; Wallace et al., 2021).

Teamwork

According to Ulenaers et al., (2021), the pandemic had a detrimental impact on communication and teamwork among nurses and students. However, it had a positive impact on communication and teamwork between nurses and physicians.

Institutional level

Impact on organizations and institutions are dealt with under the institutional level. Classroom learning and clinical learning are discussed under this level.

Classroom learning

During the pandemic, traditional classroom teaching was converted to online learning practices or remote learning methods and presentations via PowerPoint was the most commonly used online teaching method (Nodine et al., 2021; Singh et al., 2021; Soriano & Oducado, 2021; Wallace et al., 2021).

Common barriers that were identified in e-learning practices for nursing students were device logistics (Singh et al., 2021; Gaur et al., 2020), technological skills (Olum et al., 2020; Wallace et al., 2021; Singh et al., 2021; Gaur et al., 2020), lack of adequate study space, a disruptive home environment (Michel et al., 2021;

Singh et al., 2021; Gaur et al., 2020), lack of computer ownership (Singh et al., 2021; Gaur et al., 2020), internet connection problems (Michel et al., 2021; Singh et al., 2021; Bdair, 2021; Wallace et al., 2021; Olum et al., 2020; Gaur et al., 2020), high internet cost (Bdair, 2021; Olum et al., 2020; Gaur et al., 2020), increasing family burden due to limited income (Bdair, 2021; Olum et al., 2020), language barriers (Kim et al., 2021; Gaur et al., 2020), lack of familiarity with e-learning practices (Wallace et al., 2021; Gaur et al., 2020), lack of familiarity with virtual simulations (Kim et al., 2021), lack of motivation to engage in e-learning (Gaur et al., 2020), lack of student-teacher interaction (Gaur et al., 2020; Soriano & Oducado, 2021), lack of peer group discussion (Wallace et al., 2021; Gaur et al., 2020), lack of control over assessment tools such as exams, quizzes, and assignments (Bdair, 2021), and unsuitability of online modes to teach or learn practical competencies (Michel et al., 2021; Bdair, 2021).

Clinical learning

Most students voluntarily work in a crisis (Cheah et al., 2021). Some students refrained from working when considering the risks of being present in a hospital setting (Cheah et al., 2021). Some students understood that this was an opportunity to gain new knowledge as a period of their clinical life. They were able to develop the competencies needed for a successful career through increased exposure to the professional practices of senior nursing staff (Canet-Vélez et al., 2021; Ulenaers et al., 2021). Eweida et al., (2020) stated that some nursing students emphasized that clinical settings during the pandemic era have limited opportunities to gain new experiences and also that the COVID-19 outbreak acted as an aggravating factor that made some nursing students think about quitting the nursing job.

Within the framework of this novel educational paradigm, nursing students engaged in remote, non-face-to-face online practical exercises to interact with patients and caregivers in virtual environments to implement the nursing process (Chung, Kim, & Bhandari, 2023). The utilization of virtual practicum represents an innovative approach to clinical education that addresses the challenges posed by the pandemic (Chung, Kim, & Bhandari, 2023).

Community factors

The community level consists of relationships and interactions within the community. A study conducted among healthcare students in China revealed that “the participants reported high compliances to both social distancing and personal hygiene measures” (Tang et al., 2021). Nursing students were nervous and anxious on the first day of working during the pandemic, but the majority of them considered this a positive experience because they had developed bonds within the team. Depending on the workload, all the members were well organized and worked as a team by helping each other among different levels of professionals (Casafont et al., 2021).

Public policy factors

Factors that shape the behaviors and opportunities of nursing students such as policies, laws, norms are discussed under the policy level of the ecological model. A policy measure that was recommended to be implemented during COVID-19 was to strengthen the protection and contrive strategies to supplement students' professional self-confidence (Zhao et al., 2021). It is beneficial to detect early signs of a pandemic and implement procedures and restrictive measures by health ministries and universities that would assist nursing students to adapt socially, emotionally, and academically to their studies (Tang et al., 2021; Drach-Zahavy et al., 2021).

A study conducted in Saudi Arabia revealed that the Ministry of Health and other health agencies can increase social media applications as a source of knowledge dissemination related to COVID-19 (Albaqawi et al., 2020). It has been mentioned that checking content about the pandemic on social media for accuracy is essential to avoid misinformation and to ensure authentic information is communicated to the public (Tang et al., 2021).

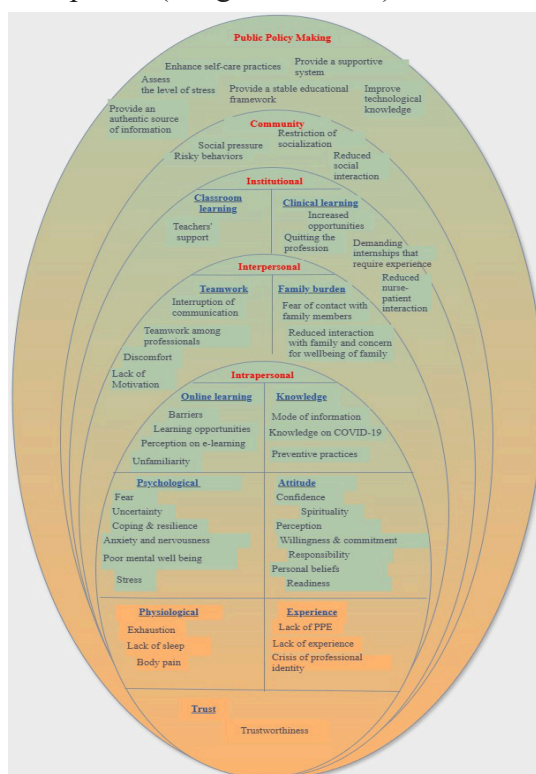


Figure 2: Findings categorized based on Bronfenbrenner's ecological model (Bronfenbrenner, 1977)

Table 1: Table containing summary of key features of the article

Study	Country of Origin	Research Method	No. of Participants (N)	Student Type	Purpose	Main Findings
Savitsky et al., 2020	Israel	A cross-sectional study	244	Nursing students	To assess the level of anxiety and ways of coping during the COVID-19 pandemic and identify association of coping strategies with characteristics of the students among nursing students in Ashkelon Academic College, Southern District, Israel	The prevalence of moderate and severe anxiety was 42.8% and 13.1% respectively Stronger resilience and usage of humor were associated with significantly lower anxiety levels, while mental disengagement with higher anxiety levels
Manning et al., 2021	United States of America (USA)	Cross-sectional survey	1212	Nursing faculty and student nurses	To describe nurse faculty and student nurse readiness to receive a COVID-19 vaccine, once available	Most full-time faculty (60%) intended to receive the vaccine; but only 45% of adjunct faculty and students reported intending to get vaccinated The major reasons for not getting vaccinated were vaccine safety and side effects Participants reported a low level of knowledge related to vaccine development
Gohel et al., 2020	India	A web-based cross-sectional survey	730	Pharmacy and medical field: physiotherapy, nursing, dental, and other allied health science background	To assess the knowledge and perceptions about COVID-19 among medical and allied health science students	Students from different institutions are having adequate awareness about COVID-19 Majority of participants acquired the information from social media which is an inauthentic resource of obtaining evidence about diseases
Zhao et al., 2021	China	Cross-sectional study	2999	Nursing students	To investigate the influencing factors in the professional identity of undergraduate nursing students after the outbreak of COVID-19	After the outbreak of COVID-19, the professional identity of undergraduate nursing students in Hebei Province significantly increased
Aslan & Pekince, 2020	Turkey	Cross-sectional study	662	Nursing students	To evaluate nursing students' views on the COVID-19 pandemic and their perceived stress levels	Student nurses perceived a moderate level of stress during the COVID-19 pandemic
Lovrić et al., 2020	Croatia	Qualitative study	33	Undergraduate nursing students	To explore how students perceive the COVID-19 crisis and what their personal experiences were while studying during the global pandemic	All students described the spread of misinformation on social networks and the risky behavior of the population as people who used public transportation did not adhere to the recommended safety measures Most were afraid of infection and worried about the well-being of their family, so they constantly applied protective measures

Olum et al., 2020	Africa	An descriptive, cross-sectional mixed-methods survey	360	Medical and Nursing Students	To assess the awareness, attitudes, preferences, and challenges to e-learning among undergraduate medical and nursing students at Makerere University, Uganda	Students recognized their responsibility to the community, its importance and risks of the nursing profession Awareness about e-learning among medical and nursing students at Makerere University is high, although attitudes are negative High internet costs, poor internet connectivity, limited technical skills on the usage of e-learning platforms, and challenges in accessing electricity are common barriers to access e-learning among the students The participants reported high compliance with both social distancing (sod) and personal hygiene measures (PHM) Male students from Hong Kong have more clinical experience. Further, individuals who lack confidence in managing threats tend to be less likely to comply with COVID-19 preventive measures
Tang et al., 2020	China	A cross-sectional Survey	2706	Students in health care programs	To investigate the associations between demographic characteristics, perceived threats, perceived stress, coping responses and adherence to COVID-19 prevention measures in Chinese healthcare students	Saudi student nurses had good perceptions of their COVID-19 knowledge and its prevention as well as positive perceptions of the government and the Ministry of Health's efforts in responding to the COVID-19 crisis Being female, being in the fourth year, and gaining good perceived knowledge were associated with high actual COVID-19 knowledge. University, gender, age, academic level, and perceived COVID-19 knowledge were the associated factors Over one-third of the participants had a high level of perceived stress, and the majority of them were practicing effective means of coping with stress
Albaqawi et al., 2020	Saudi Arabia	Quantitative, and cross-sectional design	1226	Nursing students	To assess knowledge, perceptions, and preventive behavior toward the COVID-19 pandemic among student nurses	Saudi nursing students have an acceptable level of knowledge and positive outlook towards overcoming the pandemic
Awoke et al., 2021	Ethiopia	Online cross-sectional survey	337	Undergraduate health science Student	To assess the perceived stress and coping strategies among undergraduate health science students of Jimma University amid the COVID-19 outbreak	The nursing students experienced a moderate level of perceived stress, with an average perceived stress score of 21.88 (± 4.30), while their average score for coping strategies was 74.38 (± 12.30) The IV year nursing students have the highest stress score with a mean of 22.56 ± 4.207
Begum, 2020	Saudi Arabia	A quantitative cross-sectional study	124	Students in Bachelor of Science in Nursing (BSc)	To assess knowledge, attitude and practice towards COVID-19 among the BSc nursing students of Saudi Arabia	Although more students are growing up familiar with internet-based learning, many remain resistant towards attending online classes Barriers explored in the study can limit the acceptance of online classes among undergraduate nursing students
Sheroun et al., 2020	India	Cross-sectional Online study	427	Students in BSc	To assess perceived stress and coping strategies amidst the COVID-19 lockdown among the BSc nursing students studying in nursing colleges located in Pune	
Gaur et al., 2020	India	Cross sectional descriptive survey	394	Undergraduate Nursing students	To unravel the barriers encountered during online classes among undergraduate nursing students during the COVID-19 pandemic	

Michel et al., 2021	USA	Cross-sectional online survey	868	Undergraduate nursing students	To explore nursing students' perspectives about the effects of the pandemic on their education and intention to join the nursing workforce	The pandemic has largely strengthened students' desire to become nurses. Students' psychosocial well-being has collapsed and the subsequent transition to emergency remote teaching has negatively affected students' overall wellbeing, created difficulties in learning, and highlighted challenges to obtain clinical experiences and develop nursing skills. Orientation, follow-up, and emotional support in crisis situations are key to inexperienced healthcare workers overcoming stressful emotions. Previous academic education and training may help novice future nurses feel more confident about their tasks and responsibilities as well as improve patient outcomes, resource management, and staff safety.
Casafont et al., 2020	Spain	Qualitative phenomenology design	10	Nursing students	The aim of this study was to explore and understand the experience of nursing students' roles as healthcare aides in responding to the COVID-19 crisis	The outbreak's impact on placement communities and clinical sites was exacerbated by social determinants of health, including social isolation, environmental hazards, and healthcare-seeking behaviors. The reliance on technology for clinical and social connectivity, and capitalizing on natural settings to cope with isolation and confinement. Prolonged liminality, lack of closure, and the loss of team identity were the greatest stressors brought on by the suspension of clinical activities. The findings revealed that the participants felt well equipped to deal with these circumstances through resilience, adaptability, and community ethos acquired during their placements.
Jackman et al., 2020	Canada	Photovoice and digital storytelling activities	4 8	Nursing students Medical students	The aims of the study was, 1) to give nursing and medical students co-equal status with the researchers in collection, analysis and dissemination of data pertaining to rural preceptorship; 2) to supplement the experiential learning of health care preceptorships, by giving these students an opportunity to translate their clinical experiences into knowledge through digital media; 3) to give nursing and medical students side-by-side opportunities for interprofessional learning and democratic dialogue; and 4) to produce research outputs accessible to educators, students, clinicians and policymakers, as a means of advocating for rural health care careers and policy reform in times of health crises	The study revealed three themes for advantages, four themes for challenges, and four themes for recommendations. The advantages' themes include a flexible learning environment, academic achievement, and student-centered learning, the challenges' themes were inadequacy, academic integrity, learning environment, and family burden. The themes for recommendations were training, teaching, assessment, and quality monitoring.
Bdair et al., 2021-1	Saudi Arabia	Qualitative study	10 10	Nursing students and Faculty members	To explore nursing students' and faculty members' perspectives of online learning during the COVID-19 era	Nursing students' and faculty members' experiences indicated that they were generally satisfied with online learning as an alternative strategy during the COVID-19 pandemic. The study revealed three themes for advantages, four themes for challenges, and four themes for recommendations. The advantages' themes include a flexible learning environment, academic achievement, and student-centered learning, the challenges' themes were inadequacy, academic integrity, learning environment, and family burden. The themes for recommendations were training, teaching, assessment, and quality monitoring.
Wallace S et al., 2021	USA	Qualitative descriptive design	11	Nursing students	To explore prelicensure baccalaureate nursing students' experiences of the transition to remote learning during the Spring 2020 semester in the Pacific Northwestern United States, which was significantly impacted by this shift	The sudden transition to remote learning resulted in a number of challenges for nursing students. Challenges with technology, changes in peer to peer and student to faculty relationships, and stressors related to role strain created role conflict. Despite

Drach-Zahaw et al., 2021	Israel	Cross sectional Quantitative Design	492	Nursing students	To examine nursing students' stress and coping with the COVID-19 pandemic through an ecological model of resilience	these challenges, students demonstrated a remarkable sense of resilience and perseverance Hierarchical Regression Analysis revealed that nursing students' resilience, as a multilevel factor, decreased the students' level of strain symptoms above and beyond their stress levels and control variables Specifically, the nursing students' trait resilience, perceptions of their university's positive response to the pandemic, and trust in their national policy makers were negatively associated with their strain symptoms Conversely, disengagement-in-emotion coping strategies was positively associated with the students' strain symptoms.
Crismon et al., 2021	USA	Qualitative descriptive study	82	BSc nurses, BSc nurses with nursing registration, and Doctor of Nursing	To describe recent nurse graduates' perceptions of the impact of the COVID-19 pandemic on their transition from education to practice	Participants expressed three overarching concerns: 1) altered plans such as difficulty finding employment; 2) logistical, system-related stressors including licensing delays and chaotic onboarding; and 3) feeling pride in the profession despite perceived ambivalence in public discourse
Kim et al., 2021	USA	Cross-sectional qualitative study	173	Nursing students	To explore the influence of coping mechanisms as predictors of stress, anxiety, and depression among nursing students during the lockdown period of the COVID-19 pandemic	During the COVID-19 lockdown, nursing students experienced remarkable levels of poor mental health High resilience, family functioning, and spiritual support were predictors of lower stress, anxiety, and depression
Sumen and Adbelli, 2021	Turkey	Descriptive correlational study	967	Nursing students	To examine nursing students' readiness and the coping strategies they used during the COVID-19 pandemic in Turkey	Nursing students could cope with the COVID-19 crisis while it was ongoing
Ulenaers et al., 2021	Belgium	Cross-sectional survey design.	665	Nursing students from nine Belgian nursing schools	To study nursing students' experiences during clinical placement during the COVID-19 pandemic	Nursing students expressed a strong need to be heard, prepared, and supported Most students felt supported by their nursing schools. Because of COVID-19, the role of the preceptor became more important However, due to several reasons, the preceptor did not always meet the student's expectations
Mena-Tudela et al., 2021	Spain	Cross-sectional study	237	Spanish nursing and nursing medical students	To study Spanish nursing and medical students' knowledge about COVID-19 community transmission prevention measures, treating infected patients, and their confidence and willingness to treat cases To learn their views about the first public health policy measures adopted by the Spanish government to contain the pandemic	Students' knowledge about COVID-19 community prevention measures was adequate, but not about preventive measures when treating patients with COVID-19 They felt little confidence despite being willing to treat infected patients The sample agreed with the public health measures adopted in Spain
Zhang et al., 2021	China	Online cross-sectional survey	6,348	Nursing students	To (1) assess the professional identity of Chinese nursing students during the COVID-19 pandemic; (2)	Increased level of professional identity among Chinese nursing students during the COVID-19 pandemic

				from 18 universities	identify the association between psychological resilience and professional identity during the crisis in this cohort	Psychological resilience played a significant role in professional identity development
Nodine et al., 2021	USA	A prospective, descriptive, online survey design	222	Graduate nursing students	To identify the stressors of graduate nursing students during the pandemic	The vast majority of students were employed before the pandemic and a significant decrease in employment occurred during the pandemic (97.3% to 90.1%, $p < .001$) Overall stress increased ($p < .001$) The increased total stress was associated with students participating in clinical rotations ($q = 0.024$) and having a change in work hours ($q = 0.022$) The willingness and commitment of medical and nursing students to treat COVID-19 patients was high, indicating the potential work force of healthcare providers
Cheah et al., 2021	Malaysia	A cross-sectional study	304	Medical and nursing students	To determine the commitment and willingness of medical and nursing students in Sarawak in treating patients with COVID-19 and its associated factors	Utilization of self-care practices is associated with lower psychological distress, and should therefore be promoted among nursing student populations and integrated into curricula
Brouwer et al., 2021	USA	A 10-minute electronic survey	285	Nursing students	To (1) examine self-care practices and psychological distress rates (2) assess demographic and behavioral correlations of self-care practices and psychological distress (3) determine the association between self-care practices and psychological distress, controlling for demographic and behavioral variables	
Eweida et al., 2021	Egypt	Cross-sectional descriptive study	150	Intern-nursing students	To explore the mental strain and changes in the psychological health hub among the intern-nursing students during COVID-19 pandemic	The COVID-19 pandemic was identified as a great source of mental strain among intern-nursing students at pediatric and medical-surgical units and it had a negative impact on their psychological health
Singh et al., 2021	India	Population-based study	2225	Medical and nursing students (I-IV year)	To evaluate if online teaching methods are as feasible, acceptable, and effective as in-class teaching for medical/nursing students	Students have embraced online classes well and have expressed a preference for the more innovative/technology-based teaching methods
Su Kyoungh, Chung, Kim, & Bhandari, 2023	Korea	Cross sectional survey	116	Nursing Students	This study investigated clinical competency, COVID-19-related anxiety, coping strategies, self-efficacy, and perceived stress among graduating nursing students during the COVID-19 pandemic	Self-efficacy and adaptive coping strategies are significant predictors of clinical competence during the pandemic Planning and implementing various curricular and non-curricular activities to increase senior students' self-efficacy and adaptive coping strategies will help prepare competent nursing graduates for the pandemic when they enter the nursing workforce
Martín-Delgado et al., 2021	Spain	Qualitative study	40	Nursing Students	To understand the lived experiences of nursing students who joined the health care workforce during the first wave of the COVID-19 outbreak	The analysis identified four main themes: (1) willingness to help; (2) safety and protective measures, their impact and challenges; (3) overwhelming experience: becoming aware of the magnitude of the epidemic; and (4) learning and growth
Hernández-Martínez	Spain	Cross sectional survey	503	4 th year Nursing students	To describe the experience and perceptions of students following the nursing university degree during their participation as health support in the COVID-19 health crisis in Spain	Although three out of four students were willing to provide health assistance, they recognized that they were not specially prepared in the field of intensive care and demanded training with simulation to manage anxiety and stress levels in the management of critical patients and simulation in ventilatory support

et al., 2021	Korea	Qualitative study	14	Nursing Students	To investigate nursing students' experiences with patient safety errors to inform the development of a targeted education program that promotes safe practices during the COVID-19 pandemic	This study identified the patient safety error-related experiences of nursing students during clinical practice during the COVID-19 pandemic The results suggest that in the future, nursing education institutions must establish a system for nursing students to report patient safety errors during clinical practice for patient safety education and develop practical and targeted education strategies in cooperation with practical training hospitals The study found that, the nursing students expressed predominantly adverse and ambivalent dispositions towards e-learning A reliable internet connection remained a pervasive issue Nursing students exhibit a strong preference for traditional face-to-face instruction over online learning modalities The most important results are linked to students' professional and academic preparation, how the nurses handled the pandemic situation and the characteristics of COVID-19 patients
Soriano & Oducado, 2021	The Philippines	Cross sectional study	111	Nursing students	This study examined nursing students' attitudes towards e-learning in two selected nursing schools in the Philippines	Despite the threats posed by COVID-19, students were willing to accept the government's appeal for immediate voluntary incorporation into professional practice, driven by their sense of social commitment, vocation, and professional ethics However, students conveyed messages based on negative emotions such as anxiety, fear, uneasiness and serious concern with respect to the critical health situation caused by the pandemic
Canet-Vélez et al., 2021	Spain	Qualitative study	22	Final-year nursing students	To explore the perception of educational and professional development of final-year nursing students who carried out health relief tasks during the COVID-19 pandemic	Students felt highly committed to fighting the COVID-19 pandemic, volunteering to work as nurses despite facing the unknown and not yet having finished their studies
Collado-Boira et al., 2020	Spain	Phenomenological Qualitative design	147	Final-year nursing and medical students	To study the perceptions of students during the pandemic through a phenomenological qualitative approach	Anxiety during the COVID-19 pandemic cast an adverse effect on the professional identity of nursing in students Nursing education institutions need to provide psychological counseling services for nursing students, in addition to improving their teaching of COVID-19 prevention strategies
Gómez-Ibáñez et al., 2020	Spain	Qualitative Phenomenological study	20	Final-year nursing students	To understand lived experiences of Spanish final-year nursing students employed by healthcare services to provide nursing care during the COVID-19 pandemic	
Sun et al., 2020;	China	Cross-sectional study	474	Nursing students	To evaluate nursing students' understanding of the prevention of COVID-19, as well as their anxiety towards the disease and their perception of their professional identity in the wake of the pandemic, in Zhengzhou, China	

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Discussion

The study has found that, during the COVID-19 pandemic, male nursing students reported less psychological distress than female nursing students as male nursing students showed fewer emotional responses towards the effects of COVID-19 and positively reacted to unpleasant situations. This disparity may be attributed to males exhibiting fewer emotional reactions to the adverse effects of the pandemic and demonstrating a more positive approach to challenging situations (Eweida et al., 2020; Sheroun et al., 2020; Aslan & Pekince, 2020; Savitsky et al., 2020). Management of anxiety levels depend on the students' characteristics and the coping strategies they use (Savitsky et al., 2020). Albaqawi et al., stated that, the knowledge of COVID-19 differs according to the seniority of the student. With the level of understanding and the increased exposure to the information related to COVID-19, knowledge is higher in senior students. Female students possess higher actual knowledge of COVID-19 than the male students (Albaqawi et al., 2020). This suggests that, gender was a highly significant factor that determines the knowledge level and the level of coping.

According to the students' perceptions, having special training before working in a ward setting would be a great opportunity to validate confidence, reduce fear, and intensify competencies (Hernández-Martínez et al., 2021; Ulenaers et al., 2021; Canet-Vélez et al., 2021). Gómez-Ibáñez et al., (2020) emphasized that, being a useful character in crisis was the best motivation for students to develop their skills. Moreover, the feeling of pride and excitement about working during the pandemic was customary among nursing students (Casafont et al., 2021). Practical experience was associated with increased self-efficacy among students, enabling them to navigate the pressures of clinical environments more effectively.

A contradiction was identified regarding the attitude towards the continuation of the profession. Some students claimed to consider quitting the nursing profession if the COVID-19 pandemic was to reoccur (Eweida et al., 2020). Despite the above facts, some nursing students emphasized that they would belong to the profession and never leave the profession even if they experience harmful aspects every day (Gómez-Ibáñez et al., 2020). The students strongly desired to join the workforce early by integrating their studies with practice by exposing themselves to the pandemic. During this period, students were willing to engage with the healthcare team and perform their professional duties. Students imagined themselves as professional nurses (Gómez-Ibáñez et al., 2020).

Nonetheless, the pandemic has also led to a notable sense of turmoil among nursing students, with many contemplating quitting the profession should a similar crisis emerge in the future. Despite the demonstrated fear and anxiety involved in clinical practices by the students they were willing to function as

healthcare workers during the pandemic, especially nursing and medicine students, which was an outstanding factor (Mena-Tudela et al., 2021; Cheah et al., 2021; Michel et al., 2021). Due to nursing students perceiving assisting patients as a moral duty, it enhanced their willingness to engage in treating patients in the face of COVID-19 (Martin-Delgado et al., 2021; Gómez-Ibáñez et al., 2020). Students felt a sense of commitment towards the community, the profession, and individuals (Martin-Delgado et al., 2021; Gómez-Ibáñez et al., 2020). A deep sense of moral duty to care for patients, was a driving force for nursing students' willingness to engage actively in the healthcare workforce, even in the face of fear and stress. This reveals that students possessed both positive and negative attitudes towards the influence of the pandemic on their careers. Also, the influence that the students received from society directed the decisions, and motivations in this type of traumatic situation.

Moreover, nursing students possessed negative beliefs about the pandemic and their practices (Gohel et al., 2020). Participants described a lack of motivation and poor concentration as a result of the crisis (Lovrić et al., 2020). With the highly contagious risk of the COVID-19 virus, there was a high chance of transmitting the infection to family members of the students (Collado-Boira et al., 2020; Mena-Tudela et al., 2021; Gómez-Ibáñez et al., 2020; Manning et al., 2021; Lovrić et al., 2020; Sümen & Adibelli, 2021; Ulenaers et al., 2021; Eweida et al., 2020; Awoke et al., 2021; Drach-Zahavy et al., 2021; Martin-Delgado et al., 2021; Casafont et al., 2021).

Due to teamwork, nursing students felt that they belonged to the team as professionals and not as students (Casafont et al., 2021). Some nursing students had negative perceptions and ambivalent attitudes towards online learning (Koirala et al., 2020; Soriano & Oducado, 2021). Teamwork and collaboration emerged as critical elements that helped students feel integrated within the healthcare community rather than solely as learners in clinical settings (Labrague, 2021). Ulenaers et al., (2021) stated that the COVID-19 pandemic negatively influenced communication and teamwork between nurses and students, however, some other students had the impression that communication and teamwork were improved due to the pandemic (Ulenaers et al., 2021). Further, there was a noticeably favorable impact on nurse-physician communication and teamwork (Ulenaers et al., 2021).

Furthermore, the shift towards online learning during the pandemic presented additional challenges, with many nursing students expressing ambivalence towards virtual education modalities. The COVID-19 pandemic had altered the reality of healthcare services, and video consultations were now seen as the future of healthcare (Kim et al., 2021; Jiménez-Rodríguez & Arrogante, 2020). Virtual simulations were evaluated positively by nursing students as a

means of increasing their confidence and skill in providing nursing care (Jiménez-Rodríguez & Arrogante, 2020; Kim et al., 2021). It was an ideal solution for the continuation of educational activities during the pandemic. Although e-learning fulfilled educational needs, drawbacks were identified. Some students had reported that they had no breaks between classes and some other students said that they did not have adequate time to interact with teachers during online classes (Singh et al., 2021). Some students reported a lack of interaction with faculty and inadequate opportunities for engagement during online classes, leading to dissatisfaction with their educational experiences (Semerci et al., 2020). Others, however, noted improvements in communication skills and teamwork resulting from the challenges posed by the pandemic. These contradictory responses should be evaluated further in light of future educational strategies (Li et al., 2020).

To optimize nursing education in preparation for future pandemics, the need for a well-structured disaster management curriculum is evident. Accomplishing a calamity plan to be effectively and immediately applied in a crisis by the university deans and heads of departments is an essential step to be followed to improve nursing education (Drach-Zahavy et al., 2021; Michel et al., 2021; Soriano & Oducado, 2021). If authorities take effective measures to respond to the pandemic, they will be able to enhance students' cooperation and engagement in academic and clinical activities (Drach-Zahavy et al., 2021). Planning must outline the methodologies for detecting the early signs of pandemics to permit students to adjust to health emergencies by socially and emotionally engaging in academic and clinical studies (Drach-Zahavy et al., 2021). Contemporary announcements of information from the Ministry of Health and the government are essential to improve the understanding of COVID-19 (Begum, 2020). As Brouwer et al. (2021) emphasize, it is beneficial to improve curricula that emphasize teaching self-care practices by the faculties and relevant authorities in order to develop the competencies among nursing students as this can be felicitous in a crisis.

Readiness of nursing students for future pandemics

The provision of more clinical time for nursing students can be pivotal in alleviating their fears and concerns and subsequently bolstering their confidence in decision-making skills in career preparedness (Haggard, 2022).

Nurses are the frontline workers in healthcare teams and health disasters. They are expected to be confident in facing health disasters, implementing clinical decisions, and being responsible in caring for patients (Erler et al., 2023). The nurses' sense of being safe in the working environment during the pandemic is pivotal in a pandemic (Erler et al., 2023). Quality of nursing care and comprehensive care will be ensured by the physical readiness of the responsible authorities such as health institutions, governmental ministries, universities and professional organizations.

Ensuring the readiness of quarantine areas, adequate PPE, resource readiness, safe-room facilities, valid information, immunity, and nutritional support by the hospital management are the best defenses for nurses in a pandemic (Khairina et al., 2023, Erler et al., 2023, Al Baalharith & Pappiya, 2021, Jakovljevic et al., 2024). Enhancing professional values is also a path to escalate nurses' readiness for pandemics (Erler et al., 2023). In order to protect students from rapid transmission of the virus, health authorities have forced students to quarantine themselves by limiting close contact with whom they used to be close to (Tang et al., 2021). Furthermore, authorities have encouraged students to interact and communicate by using communication apps and social media to share thoughts, difficulties and stresses (Tang et al., 2021).

The coordination of relationships with family, loved ones and with hospital management will enhance professional nursing values (Erler et al., 2023). Sympathy and a sense of inner moral duty are the best-identified paths for pandemic preparedness (Al Baalharith & Pappiya, 2021, Shakya et al., 2020). Strengthening the readiness for mass disasters, functional and structural assessments, and the availability of rapid response teams will be pivotal in preparing the healthcare force for future pandemics (Shakya et al., 2020). Nursing leaders' involvement in policy development and disaster readiness plans will strengthen the quality of nursing in future pandemics (Khairina et al., 2023).

Educating future nurses on WHO guidelines on readiness will be beneficial to improve the knowledge readiness for future pandemics (Khairina et al., 2023). One study stated that most of the nurses were knowledgeable on WHO guidelines for pandemic preparedness, precautions, and prevalence (Khairina et al., 2023). Non-natural hazard management will be strengthened by implementing training programs and involving clinical practices (Erler et al., 2023, Kusumah et al., 2024).

Furthermore, addressing the evolving landscape of nursing education, it is imperative to develop technological solutions and hybrid pedagogical designs that can effectively enhance students' preparedness for patient encounters. This strategic focus will not only safeguard the integrity and safety of patients but also equip nursing graduates with the essential competencies required for contemporary healthcare challenges (Egilsdottir et al., 2022). Enhancing the knowledge of nursing students and nurses on the utilization of robotic programs would assist nurses in caring for patients and reduce the burden of the pandemic (Shakya et al., 2020).

Given the profound impact of the pandemic on instructional methods and clinical practices, nurse educators are recommended to proactively plan strategies aimed at nurturing self-efficacy and fostering adaptive coping strategies among senior students (Chung, Kim, & Bhandari, 2023). These strategies need to encompass a diverse range of curricular and non-curricular activities to ensure that graduating nurses are ready for the pandemic when they embark on their professional journeys (Chung, Kim, & Bhandari, 2023).

Limitations

By limiting the scope of the search, the literature search was limited to only three databases. The review only includes articles published in English.

Conclusion

The study concludes that student nurses have experienced high psychological stress. It has been identified that students had to work during the pandemic due to social pressure. Most of the students refused to work during the pandemic due to fear of transmitting the disease to their family. Family support was identified as the major strength for coping. Nursing students have showed a lack of knowledge and awareness regarding infection control and prevention, as well as the usage of PPE, and some of them noted discrepancies in other professionals' clinical practices. The experience of student nurses during the pandemic was significant and they understood the true nature of their career and had their sense of professional identity increased during the COVID-19 pandemic. The findings revealed that student nurses had negative and positive attitudes towards the COVID-19 pandemic. The study identified that the pandemic had strengthened their pride in the profession. The pandemic switched traditional classroom teaching to online learning practices. The readiness of nursing students for future pandemics is influenced by a variety of factors, including psychological resilience, practical training, and knowledge acquisition. Addressing these components through targeted educational interventions and supportive environments will significantly enhance their preparedness to confront challenging healthcare crises. The study highlights the importance of strengthening the readiness of nurses for future pandemics by improving confidence and responsibility with regard to providing quality care. The study concludes with the need to implement calamity plans by the faculties and ministries as well as policies to ensure the supply of PPE during a pandemic.

Conflict of Interest

The authors have no conflicts of interest to declare.

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