

ความสัมพันธ์ระหว่างความรู้ ทักษะ และพฤติกรรมการปฏิบัติในการป้องกันโรคติดเชื้อไวรัสโคโรนา 2019 ของพยาบาลวิชาชีพ

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บทคัดย่อขยาย :

โรคติดเชื้อไวรัสโคโรนา 2019 หรือ COVID-19 (โควิด 19) ยังคงเป็นความท้าทายที่สำคัญต่อระบบสุขภาพทั่วโลก แม้ว่าจำนวนผู้ป่วยที่มีอาการรุนแรงและผู้เสียชีวิตจะลดลงนับตั้งแต่การระบาดใหญ่ทั่วโลกหลายประเทศได้ปรับให้โรคโควิด 19 เป็นโรคติดต่อที่อยู่ภายใต้การเฝ้าระวังตามปกติ อย่างไรก็ตามยังคงพบผู้ติดเชื้อรายใหม่อย่างต่อเนื่องจากการกลายพันธุ์ของไวรัสภูมิคุ้มกันที่ลดลงและการเปลี่ยนแปลงมาตรการด้านสาธารณสุข ดังนั้นสถานพยาบาลยังคงมีหน้าที่สำคัญในการดำเนินมาตรการป้องกันและควบคุมการติดเชื้ออย่างมีประสิทธิภาพ เพื่อคุ้มครองบุคลากรทางการแพทย์และผู้บริหาร ในประเทศไทยโรงพยาบาลยังคงดำเนินมาตรการป้องกันการติดเชื้อตามแนวทางของกระทรวงสาธารณสุขและองค์การอนามัยโลก

พยาบาลวิชาชีพมีบทบาทสำคัญในการป้องกันและควบคุมการติดเชื้อ เนื่องจากเป็นผู้ให้การพยาบาลแก่ผู้ป่วยอย่างใกล้ชิดและต่อเนื่อง จึงมีความเสี่ยงสูงต่อการสัมผัสโรคติดเชื้อในช่วงการระบาดของ โควิด 19 พยาบาลต้องเผชิญทั้งความเสี่ยงต่อการติดเชื้อและผลกระทบด้านร่างกายและจิตใจ ขณะเดียวกัน การติดเชื้อในบุคลากรทางการแพทย์ยังส่งผลให้เกิดการขาดแคลนกำลังคนและเพิ่มภาระงานของบุคลากรที่ปฏิบัติงานอยู่ ความท้าทายดังกล่าวสะท้อนให้เห็นถึงความสำคัญของการที่พยาบาลต้องมีความรู้ที่เพียงพอ มีทัศนคติที่เหมาะสม และปฏิบัติตามพฤติกรรมการป้องกันการติดเชื้ออย่างสม่ำเสมอ การศึกษาความสัมพันธ์ระหว่างปัจจัยดังกล่าวจึงมีความสำคัญต่อการพัฒนาแนวทางการจัดการเรียนรู้และการบริหารองค์กร เพื่อเสริมสร้างความพร้อมในการรับมือกับโรคติดเชื้ออุบัติใหม่ในปัจจุบันและอนาคต

การวิจัยครั้งนี้เป็นการวิจัยเชิงพรรณนาแบบหาความสัมพันธ์ มีวัตถุประสงค์เพื่อศึกษาความรู้ ทักษะ และพฤติกรรมการปฏิบัติในการป้องกันโรคติดเชื้อไวรัสโคโรนา 2019 ของพยาบาลวิชาชีพ และศึกษาความสัมพันธ์ระหว่างตัวแปรดังกล่าว โดยใช้กรอบแนวคิดการจัดหมวดหมู่การเรียนรู้ของบลูม (Bloom's Taxonomy) เป็นกรอบแนวคิด ซึ่งอธิบายว่าการเรียนรู้ประกอบด้วย 3 ด้านที่มีความสัมพันธ์กัน ได้แก่ ด้านพุทธิพิสัย (ความรู้) ด้านจิตพิสัย (ทัศนคติ) และด้านทักษะพิสัย (การปฏิบัติ) ความรู้เป็นพื้นฐานของการทำความเข้าใจข้อมูลด้านสุขภาพ ทัศนคติมีอิทธิพลต่อการยอมรับและแรงจูงใจ ส่วนการปฏิบัติเป็นการประยุกต์ใช้ความรู้และทัศนคติในสถานการณ์จริง โดยทัศนคติเชิงบวกช่วยส่งเสริมให้ความรู้ถูกนำไปสู่การปฏิบัติที่เหมาะสม

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กลุ่มตัวอย่างคัดเลือกแบบเฉพาะเจาะจงจากโรงพยาบาลมหาวิทยาลัยระดับตติยภูมิแห่งหนึ่งในจังหวัดนนทบุรี ประเทศไทย โดยเป็นพยาบาลวิชาชีพที่ปฏิบัติงานในหอผู้ป่วยใน มีประสบการณ์ในการดูแลผู้ป่วย โควิด 19 และยินยอมเข้าร่วมการวิจัย ขนาดตัวอย่างคำนวณด้วยโปรแกรม G*Power กำหนดระดับนัยสำคัญทางสถิติ .05 อำนาจการทดสอบ .80 และขนาดอิทธิพล .24 ได้ขนาดตัวอย่างที่ต้องการจำนวน 133 ราย และเพิ่มร้อยละ 10 เพื่อชดเชยการสูญหายของข้อมูลรวมทั้งสิ้น 146 ราย

เครื่องมือที่ใช้ในการวิจัยประกอบด้วย แบบสอบถามข้อมูลส่วนบุคคล แบบสอบถามความรู้เกี่ยวกับการป้องกันโรคโควิด 19 แบบสอบถามทัศนคติต่อการป้องกันโรคโควิด 19 และแบบสอบถามพฤติกรรมการปฏิบัติในการป้องกันโรคโควิด 19 เก็บรวบรวมข้อมูลระหว่างเดือนมิถุนายนถึงกรกฎาคม พ.ศ. 2566 ในช่วงที่มีการแพร่ระบาดของสายพันธุ์โอมิครอน การวิจัยได้รับการรับรองจากคณะกรรมการจริยธรรมการวิจัย และผู้เข้าร่วมวิจัยทุกคนลงนามในหนังสือแสดงความยินยอมก่อนเข้าร่วมการวิจัย วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนาและสหสัมพันธ์อันดับของสเปียร์แมน โดยกำหนดระดับนัยสำคัญทางสถิติที่ $p < .05$

ผลการวิจัยพบว่า กลุ่มตัวอย่างส่วนใหญ่เป็นเพศหญิง (ร้อยละ 91.8) มีอายุเฉลี่ย 29 ปี ($SD = 6.96$) เกือบทั้งหมดสำเร็จการศึกษาระดับปริญญาตรีทางการพยาบาล (ร้อยละ 99.3) มีประสบการณ์การปฏิบัติงานพยาบาลเฉลี่ย 6 ปี ($SD = 6.85$) และมีประสบการณ์ในการดูแลผู้ป่วยโควิด 19 เฉลี่ย 2 ปี ($SD = 0.79$) ประมาณครั้งหนึ่ง (ร้อยละ 50.7) ได้รับวัคซีนป้องกันโควิด 19 จำนวน 4 เข็ม ขณะที่ร้อยละ 41.0 ไม่เคยเข้ารับการอบรมเกี่ยวกับการป้องกันและควบคุมการติดเชื้อโควิด 19 โดยสื่อสังคมออนไลน์เป็นแหล่งข้อมูลเกี่ยวกับโควิด 19 ที่สำคัญที่สุด

กลุ่มตัวอย่างมีความรู้เกี่ยวกับการป้องกันโรคโควิด 19 อยู่ในระดับสูง โดยร้อยละ 93.8 มีคะแนนความรู้ในระดับสูง (ค่าเฉลี่ย = 11.21, $SD = 0.99$) ร้อยละ 91.8 มีทัศนคติเชิงบวกต่อการป้องกันโรคโควิด 19 (ค่าเฉลี่ย = 35.16, $SD = 3.27$) และร้อยละ 95.9 มีพฤติกรรมการปฏิบัติในการป้องกันโรคอยู่ในระดับสูง (ค่าเฉลี่ย = 82.21, $SD = 7.36$) ผลการศึกษาสะท้อนให้เห็นว่าพยาบาลวิชาชีพยังคงปฏิบัติตามมาตรการป้องกันการติดเชื้ออย่างเหมาะสม แม้ว่าสถานการณ์จะเปลี่ยนผ่านจากระยะการระบาดใหญ่สู่การเฝ้าระวังโรคตามปกติ

ผลการวิเคราะห์ความสัมพันธ์พบว่า ทัศนคติต่อการป้องกันโรคโควิด 19 มีความสัมพันธ์เชิงบวกกับพฤติกรรมการปฏิบัติในการป้องกันโรคอย่างมีนัยสำคัญทางสถิติ ($r = .45, p < .01$) ในขณะที่ไม่พบความสัมพันธ์อย่างมีนัยสำคัญระหว่างความรู้กับพฤติกรรมการปฏิบัติ ($r = .15, p = .08$) ผลการศึกษาชี้ให้เห็นว่า ความรู้เพียงอย่างเดียวอาจไม่เพียงพอที่จะส่งเสริมให้เกิดการปฏิบัติอย่างสม่ำเสมอ แต่ทัศนคติเชิงบวกมีบทบาทสำคัญในการผลักดันให้ความรู้ถูกนำไปประยุกต์ใช้ในการปฏิบัติ ซึ่งสอดคล้องกับกรอบแนวคิดการเรียนรู้ของบลูม

ผลการวิจัยเน้นย้ำถึงความสำคัญของการเสริมสร้างทั้งความรู้และทัศนคติเชิงบวกผ่านการพัฒนาวิชาชีพอย่างต่อเนื่อง ภาวะผู้นำที่สนับสนุน การฝึกอบรมโดยใช้สถานการณ์จำลอง การเรียนรู้ผ่านระบบอิเล็กทรอนิกส์ และการเผยแพร่ข้อมูลเชิงประจักษ์อย่างสม่ำเสมอ เพื่อเพิ่มความพร้อมของพยาบาลในการรับมือกับโรคติดเชื้ออุบัติใหม่ในอนาคตและส่งเสริมการปฏิบัติตามมาตรการป้องกันการติดเชื้อ นอกจากนี้ ควรมีการศึกษาวิจัยแบบพหุสถาบันและการศึกษาติดตามระยะยาว เพื่อศึกษาปัจจัยอื่นที่อาจมีอิทธิพลต่อพฤติกรรมการปฏิบัติในการป้องกันการติดเชื้อ อันจะนำไปสู่การพัฒนาแนวทางการส่งเสริมการป้องกันการติดเชื้อที่มีประสิทธิภาพยิ่งขึ้นสำหรับพยาบาลวิชาชีพ

คำสำคัญ : โรคติดเชื้อไวรัสโคโรนา 2019 โควิด 19 ทัศนคติ ความรู้ พฤติกรรมการปฏิบัติ พยาบาลวิชาชีพ

Relationships between Knowledge, Attitude, and Practice Behavior for the Prevention of Coronavirus Disease 2019 (COVID-19) Among Registered Nurses

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Extended Abstract:

Coronavirus disease 2019 (COVID-19) continues to challenge healthcare systems despite the decline in severe cases and deaths since the global pandemic. Although many countries have transitioned COVID-19 to an infectious disease under routine surveillance, new infections continue because of emerging viral variants, waning immunity, and changes in public health measures. Healthcare facilities therefore remain responsible for maintaining effective infection prevention and control strategies to protect healthcare personnel and patients. In Thailand, hospitals continue to implement infection prevention measures in accordance with recommendations from the Ministry of Public Health and the World Health Organization.

Registered nurses play a critical role in infection prevention because they provide continuous, direct patient care and are at increased risk of exposure to infectious diseases. During the COVID-19 pandemic, nurses experienced not only a high risk of infection but also substantial physical and psychological burdens. Infections among healthcare workers also contributed to workforce shortages and increased workloads. These challenges underscore the importance of ensuring that nurses possess adequate knowledge, maintain positive attitudes, and consistently practice appropriate infection prevention behaviors. Understanding the relationships among these factors is essential for developing educational and organizational strategies to strengthen preparedness for current and future emerging infectious diseases.

This descriptive correlational study aimed to examine registered nurses' knowledge, attitudes, and preventive practice behaviors regarding COVID-19 prevention and to investigate the relationships among these variables. Bloom's Taxonomy served as the conceptual framework, describing learning as an interaction among the cognitive (knowledge), affective (attitudes), and psychomotor (practice) domains. According to this framework, knowledge provides the basis for understanding health information, attitudes influence acceptance and motivation, and practice reflects the application of knowledge and attitudes to real-life situations. Positive attitudes facilitate the translation of knowledge into appropriate practice.

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Participants were recruited using purposive sampling from a tertiary university hospital in Nonthaburi Province, Thailand. Eligible participants were registered nurses currently working in inpatient units, had experience caring for patients with COVID-19, and were willing to participate in the study. The required sample size was calculated using the G*power program with a significance level of .05, a statistical power of .80, and an effect size of .24. The required sample size was 133, with an additional 10% added to account for potential missing data, yielding a total of 146 participants.

Four research instruments were used to collect data: a demographic questionnaire, a knowledge questionnaire on COVID-19 prevention, an attitudes questionnaire, and a preventive practice behaviors questionnaire. Data were collected from June to July 2023 during the circulation of the Omicron variant. Ethical approval was obtained before data collection, and written informed consent was obtained from all participants. Descriptive statistics and Spearman's rank correlation coefficient were used for data analysis, with statistical significance set at $p < .05$.

Most participants were female (91.8%), with a mean age of 29 years ($SD = 6.96$). Nearly all held a bachelor's degree in nursing (99.3%). Participants had a mean of 6 years of nursing experience ($SD = 6.85$) and 2 years of experience caring for patients with COVID-19 ($SD = 0.79$). Approximately half (50.7%) had received four doses of a COVID-19 vaccine, whereas 41.0% had never attended formal training related to COVID-19 prevention and infection control. Social media was the primary source of COVID-19-related information.

Participants demonstrated high levels of knowledge regarding COVID-19 prevention, with 93.8% achieving high knowledge scores (mean = 11.21, $SD = 0.99$). Likewise, 91.8% reported positive attitudes toward COVID-19 prevention (mean = 35.16, $SD = 3.27$), and 95.9% demonstrated high levels of preventive practice behaviors (mean = 82.21, $SD = 7.36$). These findings indicate that registered nurses continued to maintain appropriate infection prevention practices despite the transition from pandemic response to routine disease surveillance.

Attitudes toward COVID-19 prevention were positively associated with preventive practice behaviors ($r = .45$, $p < .01$), whereas no significant relationship was found between knowledge and preventive practice behaviors ($r = .15$, $p = .08$). These findings suggest that knowledge alone may not be sufficient to ensure consistent preventive practices. Instead, positive attitudes appear to play a more influential role in translating knowledge into practice, consistent with Bloom's Taxonomy.

The findings highlight the importance of strengthening both knowledge and positive attitudes through continuous professional education, supportive leadership, simulation-based training, e-learning programs, and regular evidence-based clinical updates. Such strategies may enhance nurses' preparedness for future emerging infectious disease outbreaks and improve adherence to infection prevention measures. Future multicenter and longitudinal studies should investigate additional factors influencing preventive practice behaviors to support the development of more effective infection prevention interventions for nurses.

Keywords: Coronavirus disease 2019, COVID-19, Knowledge, Attitude, Practice behavior, Registered Nurses

Author Contributions:

PS: Conceptualization, Method and design, Data collection, Data analysis and interpretation, Drafting the manuscript, Revising and editing the manuscript, Final approval of the submitted version

PP: Conceptualization, Method and design, Data analysis and interpretation, Drafting the manuscript, Responding to the Editor, Revising and editing the manuscript, Final approval of the submitted version, and Corresponding with the editor in chief

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Introduction

Coronavirus disease 2019 (COVID-19), first identified in December 2019 in Wuhan, China, emerged as a global pandemic, significantly impacting health systems worldwide.¹ As of July 2024, there were 775,754,322 confirmed cases globally and 7,053,902 deaths.² In Thailand, the number reached 4,795,621 confirmed cases and 34,704 deaths.² Hospital settings accounted for 70.75% of COVID-19 infections among healthcare workers, placing immense pressure on health services.³ These infections resulted in workforce shortages due to mandatory quarantines.⁴ Additionally, nurses who were exposed to the virus and contracted COVID-19 are affected in both physical and mental health. It also affects the work efficiency of nurses.⁵

The novelty of COVID-19 presented challenges for nurses, particularly due to limited training and rapidly evolving guidelines. This lack of preparation increased the risk of misinterpreting symptoms and implementing inadequate prevention measures, thereby heightening transmission risks in healthcare settings.⁷ In Thailand, a recent study reported that 54.5% of nurses had insufficient knowledge regarding COVID-19 prevention and control.⁸ The problem of COVID-19 infection in nurses who provide care to patients may be caused by insufficient preventive behaviors, such as hand washing, wearing a mask, having close contact with patients <2 meters, touching the surfaces around the patient, wearing personal protective equipment (PPE), and not being able to access infection prevention training, etc.^{9,10}

Therefore, nurses must be prepared to receive the knowledge and emotions to comply with preventive measures. In the initial stage of learning, nurses may imitate the steps of wearing PPE from others or practice on their own through trial and error until they gain more confidence and expertise. They can adjust their practices according to the context and develop new methods to increase the effectiveness of prevention, such as training colleagues to practice safely. This study employs Bloom's Taxonomy⁶ as a conceptual framework for understanding how knowledge, attitudes, and practices (KAP) interact. It posits that knowledge influences attitudes, and attitudes, in turn, drive practice. Without sufficient attitudes, knowledge may not be utilized or put into practice. Having sufficient knowledge about infectious diseases enhances confidence and supports preventive behaviors.¹¹ Therefore, nurses need to continuously update their knowledge about emerging infectious diseases, and nursing skills are essential for the safety of patients and the healthcare team. Thus, knowledge plays a vital role in caring for COVID-19 patients.

Attitude also plays a critical role in influencing behavior. Nurses with positive attitudes are more confident and proactive in managing patients and adhering to prevention protocols. Farah et al.¹² reported that 52.1% of healthcare providers exhibited positive attitudes and confidence in COVID-19 prevention. Similarly, Alrubaiee et al.¹³ found 85.1% of providers had positive attitudes.

Preventive behavior is crucial for nurses caring for COVID-19 patients to ensure proper and effective treatment and minimize virus transmission.⁵ Despite vaccination, healthcare workers remain at risk due to

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their close contact with COVID-19 patients. Strict adherence to infection control measures and universal precautions remains essential.¹⁴

Previous studies have shown significant correlations among knowledge, attitudes, and practices. Alrubaiee et al.¹³ found a significant positive relationship between knowledge and attitudes among healthcare providers ($p < 0.001$). Consistently, Lee, Kang, & You¹⁵ found that knowledge directly affects attitudes such as risk perception, belief in effectiveness, and practices such as personal hygiene and social distancing. Enhancing both knowledge and attitudes contributes to greater confidence and improved preventive behavior.¹⁶ For example, Tantantrakun, Phinnarach, Loeknok, and Yamsri¹⁷ revealed a significant correlation between basic health knowledge and preventive behavior among first-year nursing students ($p = 0.01$), while Shawahna¹⁸ found that better knowledge was linked to improved prevention practices among nurses ($p < 0.001$). Mohamed, Mohamed, and Taha¹⁹ emphasized the importance of training to enhance knowledge and adoption of effective preventive measures.

Research has also indicated a positive relationship between attitudes and practice behaviors.^{20,21} Previous research has found a significant relationship between attitudes and practices among healthcare workers in Dubai regarding COVID-19 guidelines ($p < 0.05$).²⁰ Similarly, another study found a positive relationship between attitudes and COVID-19 preventive behaviors among nurses.²¹

However, not all studies support this pattern. Hussin & Paul²² found no significant correlation between knowledge and attitude among ICU nurses,

suggesting that experience and familiarity with severe COVID-19 cases may influence outcomes independently of attitudes. Saber et al.²³ found no correlation between attitudes and practices, suggesting that adherence to guidelines might occur regardless of personal beliefs. Furthermore, Albahri et al.²⁰ found that knowledge was not significantly related to practice regarding COVID-19 among healthcare workers in primary healthcare centers in Dubai ($r = 0.019$, $p = 0.80$), although the practice of controlling COVID-19 infection was high level. This suggests the need for ongoing education and up-to-date information to influence behavior meaningfully.

In Thailand, there is a lack of comprehensive studies addressing all three components—knowledge, attitudes, and practices—among nurses with direct experience caring for COVID-19 patients. Existing studies have predominantly targeted nursing students or university staff, with limited focus on frontline nurses.²¹ This study was conducted in a tertiary university hospital equipped with adequate personal protective equipment (PPE), isolation facilities, and negative pressure rooms for COVID-19 patients in both inpatient and co-ward settings. The researcher, an ICU nurse providing care for patients with severe COVID-19 symptoms, recognized the importance of understanding KAP among professional nurses directly involved in patient care, as they are at the frontline of both acquiring and potentially transmitting the infection. Given their critical role in infection control and high risk of exposure, assessing KAP among this group is essential. The frequent mutation of the virus and evolving clinical guidelines further underscore the need for nurses to continually update their knowledge and adapt their practices.

Objectives of the study

This study aimed to investigate the levels of knowledge, attitudes, and practice behaviors related to COVID-19 prevention and to examine the relationships among knowledge, attitudes and practice behaviors in registered nurses.

Conceptual Framework and Literature Review

This study is guided by Bloom's Taxonomy of Learning⁶, specifically the Knowledge-Attitude-Practice (KAP) model, which is widely used to evaluate health behaviors. Initially applied in the 1950s to study family planning in India, the KAP framework continues to be relevant in understanding behavioral responses to public health challenges. Bloom's taxonomy includes three learning domains: (1) the cognitive domain, which encompasses intellectual skills such as knowledge, comprehension, application, analysis, synthesis, and evaluation; (2) the affective domain, involving emotions, values, and beliefs that influence attitudes and motivation; and (3) the psychomotor domain, which involves physical skills such as coordination and precision.⁶

According to Bloom's theory, knowledge, attitudes, and practices are interdependent. Knowledge stimulates cognitive processes that shape attitudes, which in turn influence behavior.²⁴ While knowledge is foundational, Bloom's framework emphasizes that attitudes play a crucial role in motivating individuals to act. Without a positive attitude, knowledge alone may not result in behavioral change.²⁴

Since COVID-19 emerged in 2019, knowledge related to its prevention has evolved rapidly. Nurses, as frontline healthcare providers, must absorb new information through training, practice, and continuous updates. Their role in patient care puts them at the highest risk of exposure, making their knowledge of COVID-19 prevention critical not only for their safety but also for the safety of their patients and the public. Effective knowledge allows nurses to assess patients accurately and provide evidence-based care. It also supports self-protection and the prevention of cross-infection.²⁵

Moreover, positive attitudes enhance nurses' motivation and confidence, which are necessary for maintaining high standards in patient care, especially during crises like a pandemic. Hussin & Paul,²² found that nurses with a positive attitude improved their knowledge and practice related to COVID-19 care. These improvements were influenced by clear communication of institutional policies and support from nursing leadership. Together, these elements contribute to better patient outcomes and safety.

Preventive behaviors, such as hand hygiene, appropriate use of personal protective equipment (PPE), and adherence to infection control protocols, are essential for curbing COVID-19 transmission. These behaviors depend not only on what nurses know or believe, but also on their ability to apply this knowledge consistently in clinical settings.

Bloom's Conceptual Framework,⁶ affirms that effective practice requires prior knowledge and understanding of the subject matter before application. Through learning and experience, individuals can carry out tasks methodically. Continued practice, informed by new evidence and evolving guidelines, enhances expertise and improves health outcomes.

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In summary, from the literature review mentioned above, nurses play a crucial role in caring for COVID-19 patients, from screening to discharge, including patients in the recovery phase, preparing to go home, and those who pass away. At every stage of nursing care for COVID-19 patients, nurses are at risk of exposure and infection with COVID-19. Yet in Thailand, few studies have examined the KAP model comprehensively among nurses with direct experience in COVID-19 care. Given the ongoing evolution of the virus and frequent changes in guidelines, nurses must stay informed and flexible. This underscores the importance of equipping them with accurate, current knowledge, fostering constructive attitudes, and supporting behavior that aligns with best practices for infection prevention.

Research hypothesis

The hypotheses tested were: (1) knowledge about COVID-19 prevention is associated with practice behaviors regarding the prevention of COVID-19; (2) attitudes toward COVID-19 prevention are associated with practice behaviors regarding the prevention of COVID-19.

Methods

This study utilized a descriptive cross-sectional design. The sample size was determined using the G*Power program²⁶ with a power of .80, a significance level of .05, and an effect size of 0.24 based on prior studies.^{21,27} The required sample size was 133, with an additional 10% added to account for potential

dropout,²⁸ resulting in 146 participants. The sample was selected through purposive sampling based on the following inclusion criteria: registered nurses working in an inpatient ward, with experience caring for COVID-19 patients, and willing to participate in the research.

Instruments

Data were collected using four validated questionnaires:

1. Demographic questionnaire was developed by researchers and includes items on gender, age, marital status, religion, education, workplace, nursing experience, COVID-19 care experience, training history, information sources, vaccination status, and infection history.

2. Knowledge towards the Prevention of Coronavirus 2019 (COVID-19) Assessment adapted from the COVID-19 Knowledge assessment developed by Geounuppakul et al.,²⁹ which evaluated knowledge regarding the symptoms, incubation period, transmission, incubation period, prevention, and treatment of COVID-19, included 12 items, rated as correct/incorrect. The scores will be interpreted based on Bloom's knowledge level classification (Bloom, 1968).³⁰ Scores were categorized into low (0–7), moderate (8–9), and high (10–12). The instrument was evaluated for content validity by three experts. The content validity index (CVI) was 0.83. Kuder-Richardson 20 (KR-20) was 0.76 for the 20-pilot sample and 0.82 for the participants in this study.

3. Attitude towards Prevention of Coronavirus 2019 (COVID-19) Assessment adapted from Attitude assessment toward COVID-19 prevention by Panyawan et al.,²¹ which composed of questions about confidence, support, motivation, and responsibility of COVID-19 infection prevention such as preventing COVID-19 is important and beneficial, and every healthcare provider must have knowledge about COVID-19 prevention, etc., included 10 items (9 positive, 1 negative). The assessment is a 4-point Likert. The criteria for interpreting the scores are based on the scoring guidelines by Kaiyawan (2009).³¹ Scores were categorized into three levels: negative attitude (10–20), neutral attitudes (21–30), and positive attitude (31–40). Scores ranged from 10–40, with higher scores indicating more positive attitudes. Before totaling the scores, the negative question score will be reversed. The instrument was evaluated for content validity by three experts. CVI was 0.77. Cronbach's Alpha coefficient was 0.75 for the 20-pilot sample and 0.80 for the participants in this study.

4. Practice Behavior Towards Prevention of Coronavirus 2019 (COVID-19) Assessment adapted from a Practice behavior towards prevention of COVID-19 questionnaire by Panyawan et al.,²¹ which consists of questions about COVID-19 infection prevention such as hand washing, cleaning of contact areas, social distancing, wearing PPE, etc., including 19 items designed to be answered based on the frequency of behavior, rated on a 5-point Likert scale. The scoring interpretation is based on the guidelines by Kaiyawan (2009).³¹ Total scores were categorized into three levels of COVID-19 practice

behavior for the prevention as low (19–44), moderate (45–69), and high (70–95). The instrument was evaluated for content validity by three experts. The content validity index (CVI) was 0.84. Cronbach's Alpha coefficient was 0.79 for the 20-pilot sample and 0.85 for the participants in this study.

Human subject protection

Ethical approval was granted by the Institutional Review Board of the Faculty of Medicine Ramathibodi Hospital, Mahidol University (COA. MURA2023/182), and the Human Research Protection Committee of PCMC (EC 009/66). The researcher explained the research objectives, data collection procedures, and participants' rights, including voluntary participation and the right to withdraw at any time. Participants were assured of confidentiality, informed that data would be reported in aggregate, and that participation would not affect their employment. The study was conducted solely for academic purposes.

Data collection

Data collection was conducted from June to July 2023 following IRB approval. The primary investigator (PI) coordinated with nursing unit leaders to explain the study and request collaboration. Purposive sampling was used to select participants who met the inclusion criteria. After informed consent was obtained, participants completed the questionnaires, which took approximately 15 minutes. Completed questionnaires were sealed in envelopes and returned to the PI within one week.

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Statistical Analysis

Data were analyzed using the SPSS software. Descriptive statistics (frequency, percentage, mean, and standard deviation) summarized demographics, knowledge, attitudes, and practice levels. Spearman's rank correlation was used to assess relationships among knowledge, attitudes, and practice behavior for the prevention of COVID-19 due to non-normal data distribution, confirmed via the Kolmogorov-Smirnov test.

Results

The participants included 146 registered nurses, 12 males (8.20%) and 134 females (91.80%), with a mean age of 29 years (range 23-60, SD = 6.96). Most participants were single (73.30%) and Buddhist (95.90%). Nearly all held a bachelor's degree (99.30%), with only one participant (0.70%) having a higher degree.

Regarding work settings, 69.20% worked in general wards, 13% in VIP/special wards, and 17.80% in intensive care units. Nursing experience ranged from 1 to 38 years (mean = 6.26, SD = 6.85), and COVID-19 care experience ranged from 1 to 3 years (mean = 1.97, SD = 0.79). Most participants (41.10%) had never received training in COVID-19 prevention, while 39% attended one session and 15.80% attended three to five sessions. Over half (53.40%) received internal training. The majority of knowledge sources came from internal sources (55.50%), followed by social media (38.40%). Most participants (50.70%) had received 4 COVID-19 vaccine doses, with a mean of 4.12 (SD = 0.81). In terms of infection history, 70% had previously contracted COVID-19, 24% had not, and 6% had been exposed or in contact with infected healthcare workers. 30.10 percent of registered nurses have never been infected with COVID-19, while the remaining nearly 70 percent have been infected 1 to 3 times. (See Table 1)

Table 1 Number and percentage of the participants classified by personal information (N = 146)

Personal Information		N	%
Gender			
	Male	12	8.20
	Female	134	91.80
Age (Min = 23, Max = 60, Mean = 29.27, SD = 6.96)			
	21-39 years old	135	92.50
	40-60 years old	11	7.50
Marital Status			
	Single	107	73.30
	Married	36	24.60
	Widow	0	0.00
	Divorced/Separate	3	2.10

Table 1 Number and percentage of the participants classified by personal information (N = 146) (con't)

Personal Information	N	%
Religion		
Buddhist	140	95.90
Muslim	5	3.40
Christianity	1	0.70
Education level		
Bachelor's degree	145	99.30
Higher than a bachelor's degree	1	0.70
Workplace		
General wards	101	69.20
VIP/special wards	19	13.00
Intensive care units	26	17.80
Nursing experience (Mean = 6.26, SD = 6.85)		
0-2 years	36	24.70
2-5 years	63	43.20
5-7 years	9	6.10
7-10 years	14	9.60
> 10 years	24	16.40
Experience in caring for COVID-19 patients (Mean = 1.97, SD = 0.79)		
1 year	47	32.20
2 years	58	39.70
3 years	41	28.10
Training received on COVID-19 prevention knowledge and skills (Mean = 0.86, SD = 0.94)		
Never received	60	41.10
1 time	57	39.00
2 times	23	15.80
3 times	4	2.70
4 times	0	0.00
5 times	2	1.40
Training about COVID-19		
Internal training	78	53.40
External training	5	3.40
Never received training	60	41.10
Both internal and external training	3	2.10

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Table 1 Number and percentage of the participants classified by personal information (N = 146) (con't)

Personal Information	N	%
Sources of knowledge on COVID-19 prevention		
(1 person can select more than one answer)		
Internal source	81	55.50
External source	5	3.40
Other media forms		
– Medical journals	19	13.00
– Medical websites	28	19.10
– Social media	56	38.40
Vaccination history (Mean = 4.12, SD = 0.81)		
2 doses	5	3.40
3 doses	22	15.00
4 doses	74	50.70
5 doses	42	28.80
6 doses	3	2.10
History of COVID-19 infection		
Risk or had been in contact with healthcare workers who contracted COVID-19	9	6.00
Never contracted COVID-19	35	24.00
Previously contracted COVID-19	102	70.00
Number of COVID-19 infection (Mean = 0.86, SD = 0.69)		
Never Infected	44	30.10
1 time	80	54.80
2 time	20	13.70
3 times	2	1.40

Knowledge levels were high in 93.80% of participants, with an average score of 11.21 out of 12 (SD = 0.99) (Table 2). The item with the highest correct response rate (99.30%) stated that “COVID-19 is easily transmitted through droplets from coughing and sneezing” and that “some strains can spread rapidly to many people.” The most frequently misunderstood item (35.60% incorrect) was “If you suspect you are at risk, self-isolation is not required unless symptoms appear, but wearing a mask and testing immediately if symptoms develop is necessary.”

Positive attitudes were reported by 91.80% of participants, with a mean attitude score of 35.16 (SD = 3.27) (Table 2). The highest average score was “Every healthcare provider must know about COVID-19 prevention,” (mean = 3.86, SD = 0.36), with 87% strongly agreeing. The item with the lowest agreement (36.30%) was “nurses do not need to perform ATK or RT-PCR tests on asymptomatic or non-existent COVID-19 patients before hospitalization to detect COVID infection because nurses are fully vaccinated” (mean = 2.16, SD = 1.09).

A majority (95.90%) demonstrated high levels of preventive practice, with a mean score of 82.21 out of 95 (SD = 7.36) (Table 2). The most consistently practiced behavior was hand hygiene after contact with patients or body fluids (mean = 4.74,

SD = 0.49); 76% reported always performed doing this. The least practiced behavior was maintaining physical distance of at least 2 meters (mean = 3.46, SD = 0.91); 1.40% reported never doing this.

Table 2 Number and percentage of the participants classified by knowledge, attitudes, and practice behaviors toward COVID-19 prevention (N = 146)

Variable	N	%
Knowledge (Range 8 – 12, Mean = 11.21, SD = 0.99)		
– Moderate knowledge (8–9 points)	9	6.20
– High knowledge (10–12 points)	137	93.80
Attitudes (Range 20–40, Mean = 35.16, SD = 3.27)		
– Negative attitude (10–20 points)	1	0.70
– Neutral attitude (21–30 points)	11	7.50
– Positive attitude (31–40 points)	134	91.80
Practice Behavior (Range 60 – 95, Mean = 82.21, SD = 7.36)		
– Moderate level of practice behavior of COVID-19 prevention (45–69 points)	6	4.10
– High level of practice behavior of COVID-19 prevention (70–95 points)	140	95.90

Knowledge was significantly correlated with attitudes ($r = .25$, $p < .01$), and attitudes were significantly correlated with practice behaviors toward COVID-19 prevention ($r = .45$, $p < .01$). However,

knowledge was not significantly correlated with practice behaviors toward COVID-19 prevention ($r = .15$, $p = .08$) (Table 3).

Table 3 Correlation Among Knowledge, Attitudes, and Practice Behaviors Toward COVID-19 Prevention (N = 146)

Variable	Knowledge	Attitudes	Practice Behaviors
Knowledge	–		
Attitude	.25**	–	
Practice Behavior	.15	.45**	–

**Correlation is significant at the 0.01 level (2-tailed).

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Discussion

This study assessed the levels and relationships between knowledge, attitudes, and practice behaviors related to COVID-19 prevention among registered nurses. The findings are interpreted through the lens of Bloom's Learning Theory, which outlines three domains of learning: cognitive (knowledge), affective (attitude), and psychomotor (practice/behavior). This theoretical framework supports the interpretation of how knowledge and attitudes translate into practice. The findings revealed that 93.80% of participants had high knowledge levels regarding COVID-19 prevention, likely due to access to online information, hospital training, and practical experience. According to Bloom's cognitive domain, knowledge acquisition forms the foundation for higher-order thinking and informed decision-making. These results align with Geounupakul et al.,²⁹ who reported high knowledge scores among staff and students, and Hatami et al.,³² who reported that 84.70% of Iranian healthcare workers had high knowledge levels. Nearly all participants (99.30%) were accurate about COVID-19 transmission through droplets from coughing and sneezing, consistent with Saadeh et al.²⁵ and Hatami et al.³² Additionally, 98.60% of participants correctly recognized the main symptoms of COVID-19, including fever, dry cough, sore throat, runny nose, and body aches, consistent with the study by Farah et al.¹⁰ and Albahri et al.²⁰ This indicates that participants had successfully reached the application levels within Bloom's cognitive domain.

Positive attitudes were found in 91.80% of participants, data collection during the Omicron phase, likely improved access to vaccines, medications, and protective equipment, along with increased experience in patient care. These findings are consistent with study by Al-Dossary et al.,⁷ which reported that 60.40% of nurses in Saudi Arabia had positive attitudes, and Alrubaiee et al.,¹³ who found 85.10% of healthcare providers in Yemen reported positive attitude towards COVID-19.

High levels of practice behaviors (95.90%) were reported, indicating strong adherence to infection control protocols. This behavior may be influenced by knowledge access through social media, workplace training, and practical experience. This supports Tien et al.,³³ who found 83.10% of healthcare workers in Vietnam followed preventive behaviors, while Anuar et al.³⁴ found 90.90% adherence among Malaysian healthcare workers. The most consistently practiced behavior was hand hygiene after contact with patients or body fluids, in line with Ghulam et al.,³⁵ who found 77.40% practiced proper handwashing, and Al Marzouqi et al.,³⁶ who noted 91.60% compliance. Saadeh et al.²⁵ also observed regular cleaning of frequently touched surfaces. However, maintaining social distance was the least practiced behavior, likely due to the reduced perceived severity of COVID-19 during the Omicron phase. Despite lower infection rates, physical distancing remains essential.

The study also found a significant correlation between attitudes and practice behaviors in preventing COVID-19 ($r = .45, p < .01$). When a person is open to receiving, responding, and valuing something,

a positive attitude is created, which develops into a Characterization by a value, reflected in consistent and continuous practice behavior.²⁴ This is consistent with findings by Alrubaiee et al.¹³, and Maurya, Upadhyay³⁷. A good attitude will lead to the acceptance that the behaviors are valuable and can help prevent COVID-19. Many healthcare workers are infected with COVID-19 while performing procedures such as intubation, CPR, and aerosol treatments due to improper use of masks, gowns, and gloves, so it is essential to have a positive attitude towards behavior on how to put on and remove personal protective equipment (PPE). However, some studies found that attitudes were unrelated to practice behavior. The study by Saber et al.,²³ an assessment of nurse's knowledge, practice, and attitude regarding the prevention and control of COVID-19, found that attitudes were not related to behavior because attitudes depend on beliefs and feelings of each person.

Regarding COVID-19 preventive behaviors, most nurses performed according to established guidelines. However, no significant relationship was found between knowledge and practice behaviors ($r = .15$, $p = .08$), suggesting that knowledge alone may not be sufficient to drive behavioral change. According to Bloom's Learning Theory, effective practice (psychomotor domain) requires more than cognitive understanding—it must be reinforced by affective components such as motivation, confidence, and value internalization, as well as contextual factors like environmental support and access to resources. This finding is supported by Hussin and Paul,²² who noted that in critical care settings, nurses' experience and confidence—not just knowledge—were more

predictive of practice behaviors. Familiarity with infection control procedures, stress resilience, and team collaboration may enhance performance, regardless of knowledge levels. Although Bloom's theory posits that knowledge should support behavior, the current study's results indicate a disconnect, possibly due to the absence of affective engagement or supportive context. High knowledge levels without accompanying positive attitudes may not translate into consistent behavior. Therefore, to promote effective prevention practices, it is essential to ensure that nurses possess not only accurate knowledge but also favorable attitudes and an enabling environment. These factors together foster appropriate and sustained behavior in preventing the spread of COVID-19.

Recommendations for future research

Nursing Practice Aspect

The findings indicate that registered nurses demonstrated high levels of knowledge, positive attitudes, and strong preventive behaviors related to COVID-19. While knowledge significantly influenced attitudes, attitudes had a greater impact on practice behaviors. It suggests that fostering positive attitudes may be key to improving preventive practices among nurses. Ongoing training, access to reliable information, and institutional support are essential for maintaining high standards in infectious disease prevention. Healthcare administrators should prioritize continuous education and encourage a positive work environment to strengthen nurses' readiness for future epidemics. Developing multimedia tools such as videos and e-learning modules may also enhance knowledge dissemination and behavioral reinforcement.

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Research Aspect

Further studies should investigate additional factors that may influence knowledge, attitudes, and behaviors, such as age, gender, education level, work experience, experience in caring for COVID-19 patients, and training on COVID-19.

Limitations of the study

This study has notable limitations. First, it was conducted in a single tertiary care hospital, which may limit the generalizability of the findings to other healthcare settings. Future research involving multiple hospitals or regions is recommended to enhance external validity. Second, because COVID-19 is a continuously evolving disease, with frequent updates in prevention guidelines and protocols, participants' knowledge and practices may vary over time, potentially affecting the reliability of responses.

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