Determinants of COVID-19 Infection Prevention Practices Among Employees of a Medical Center in NCR, Philippines

Cindy P. Mamangun; Kathryn Ellyse C. Burgonio; Isabel Anastasia G. Esguerra; Asheley Bernice M. Naval; Ryanne Therese G. Caynap; Anna Katrina Ysabel Y. Bergonio and Ma. Rosario Bernardo-Lazaro, MD, MBAH, FPAFP

Background: The COVID-19 pandemic became a severe public health threat to the Philippines, overwhelming the health system and its healthcare workers. As infections spread globally, it became imperative to understand the infection prevention practices (e.g., face mask-wearing, handwashing, social distancing) to better understand the pandemic and its effects on the healthcare workforce.

Objective: The study aims to describe the sociodemographic and medical profile and the COVID-19 infection prevention practices, and the correlation between both among employees of a medical center in the National Capital Region (NCR), Philippines,

Methods: The analytic cross-sectional study utilized an online survey administered to employees of a medical center in NCR, Philippines. A total of 112 responses were analyzed. Descriptive statistics were used to analyze respondents' sociodemographic and medical characteristics and summarize their COVID-19 infection prevention practices. Spearman's rank correlation and Pearson's chi-square tests were performed to determine the association of the respondents' sociodemographic and medical profiles with their corresponding infection prevention practices.

Results: Majority of respondents were between ages 30-50 (52.68%), female (71.43%), with college (83.93%) as their highest educational attainment, single (70.54%), and without comorbidities (66.07%). 76.5% (72/94) of respondents living in multi-person households lived with familial ties, and 59.6% (56/94) of respondents living in a multi-person household lived with at least one member considered a high-risk individual (i.e., a senior citizen with comorbidities). The respondents practiced face mask-wearing (4.92) and respiratory etiquette (4.90) the most, whereas reduction of unnecessary outings (3.81), not drinking alcohol (3.81), and sleeping at least 7 hours per day (3.42) were least practiced. Results showed that only age and having chronic kidney disease correlated with infection prevention practices with a p-value of <0.05, showing that people with chronic kidney disease and those aged 30-50 were more likely to engage in infection prevention practices.

Conclusion: The study findings provide insight into sociodemographic and medical factors that may contribute to adherence to infection prevention practices among the hospital-based workforce. Recommendations for further research were discussed.

Key words: COVID-19 infection, prevention, practices, hospital

Introduction

Healthcare workers are regularly exposed to increased risks of contracting infectious diseases and are the most vulnerable during global health crises like the COVID-19.[1] Worldwide, healthcare workers were placed on the frontlines of the COVID-19 response, but the unpreparedness of many governments and the high rate of infection devastated many countries, including the Philippines. The healthcare system in the country became significantly overwhelmed as the demand strained the supply of healthcare workers due to various factors, such as work overload, fatigue, psychological stress, sickness, and resignation due to unpaid benefits, among others.[2,3] Unfortunately, this impact on the health workforce and the rise in infections led to an increase in morbidity and mortality among healthcare workers, which exacerbated the capacity of countries to control COVID-19 transmission.[3] Given that healthcare workers have continuous exposure to diseases and have huge roles in controlling these diseases, it is crucial that there are sustained and improved efforts to protect them. As a high-risk group, especially in

Ateneo School of Medicine & Public Health

a pandemic, the infection spread in health facilities must be managed readily through prevention.[4] Otherwise, the safety of both patients and healthcare workers becomes compromised.

Primary protection through disease spread prevention can be achieved by implementing infection prevention practices (IPP) such as hand-washing, wearing face masks, and social distancing. According to a study by Wake (2020), common global IPPs include hand-washing and proper hand hygiene, avoiding large crowds, and wearing face masks.[5] These practices reflect in the infection prevention advisories from international and local agencies, including the World Health Organization (WHO) and the Philippines' Department of Health (DOH), which were released as early as January 2020.[6,7] In the Philippines, face mask-wearing was noted to be the most common infection prevention practice, particularly among select employed workers and college students from Manila.[8,9] The same was observed in a healthy population of primarily single female Filipinos with an average age of 29 years old living in the National Capital Region (NCR) and engaged in a non-medical occupation.[10] A study among exposed healthcare workers in COVID-19 treatment centers in Ghana showed that healthcare workers who were separated, divorced, or widowed exhibited lower adherence to personal protective equipment (PPE) usage during healthcare interactions.[11] Moreover, in a study in a hospital in Northwest Ethiopia, advanced age, longer work experience, and a higher level of education demonstrated an association with infection prevention practices.[12]

The COVID-19 pandemic emphasized the potential of strict implementation of IPPs and adherence to protocols in effectively reducing infection spread. Wee, et al. (2020) found that increased adherence to standard IPPs due to the pandemic, particularly PPE use and hand-washing, significantly decreased and controlled cases of hospital-acquired respiratory viral infections.[13] Yuan, et al. (2021) discussed the influence of sociodemographic variables, describing characteristics such as biological sex and education level that were associated with a higher level of adherence or higher preventive behavior scores.[14] In a study by Shahnazi, et al. (2020) in Iran, females and urban dwellers were found to have a higher level of adherence, suggesting that males and rural dwellers should receive preventive interventions.[15] Arceo, et al. (2021) also showed that adherence was significantly higher among females, noting that the finding is common in various related studies, such as the one involving hospital staff workers.[16]

With the evolution of knowledge regarding COVID-19 and the disease progression in the country, recommendations on IPPs evolved. As the government eases regulation on publicly mandated IPPs, there is a need for proactive and sustainable IPP campaigns to maintain adherence and to keep infections under control. There is an opportunity to improve hospital-based IPP campaigns, training, and monitoring by exploring potential sociodemographic and medical factors influencing adherence to IPPs. Healthcare workers and those working in a hospital have an increased risk of infectious diseases such as COVID-19, so it is crucial to understand their population and design evidence-based preventive interventions. Therefore, this study aimed to describe the sociodemographic and medical profile and COVID-19 IPP of the employees of a selected Level 3 medical center in NCR and the association between both variables. Through this study, the selected medical center may be able to use the information to effectively promote specific IPPs to targeted sociodemographic and medical groups.

Methods

Study Design and Setting

The study utilized an analytic cross-sectional study to determine the association among the different variables, particularly the respondents' sociodemographic and medical profiles and their COVID-19 infection prevention practices (IPPs). The study was done among the employees of a Level 3 medical center in NCR. The medical center in the study is a tertiary care hospital that provides medical services, including regenerative medicine, wellness and aesthetics, cardiovascular, cancer, the neurological sciences, eye and vision, ENT, head and neck, acute and critical care, pediatrics, and women's health. It serves an estimated 50,000 inpatients and 500,000 outpatients, annually.

Subjects and Method of Recruitment

Among the 1,000 employed members of medical center, a sample size of 334 respondents was computed, considering a desired 5% level of error and a 20% non-response rate.[10] The data collection tool or survey form was distributed to the study population through an online survey via Google Forms. To distribute the survey, the researchers frequently communicated with a representative from the medical center. The said representative repeatedly sent the link to the online survey to the employees via online messaging platforms such as Messenger and Viber. Other distribution avenues such displaying the physical poster in various areas inside the medical center, uploading the poster in Facebook groups, and directly messaging employees through Facebook and LinkedIn, were done as discussed with the representative of the medical and as allowed in the setting. The study utilized a purposive sampling design as the researchers deemed it most feasible to obtain subjects via the stated distribution avenues. To incentivize responses to the survey, the said spiels and posters also indicated that 500php through digital wallet would be raffled off to six (6) respondents.

Tools for Measurement and Data Gathering

A survey form was used to collect the data. Questions in the survey were based on similar studies by Shahnazi, et al. (2020) and Pratseyo, et al. (2020).[15,17] The survey was written in English and translated by the researchers in Filipino. The survey was pilot tested on ten respondents of similar occupational backgrounds prior to its administration. The survey's reliability was determined through the utilization of Cronbach's alpha, where a value of 0.8 was obtained. The criteria for inclusion required that the respondent was employed (i.e., directly hired and paid wages) by the medical center. Conversely, respondents were excluded if they were not directly hired or paid wages by the medical center. Subjects were included in the study according to availability and accessibility. The first part of the survey elicited respondents' sociodemographic profile: age, sex, city of residence, educational attainment, marital status, current residence, living arrangement, and medical profile which included comorbidities. The second part consisted of 14 questions answered on a 5-point Likert scale which elicited data on the respondents' infection prevention practices (IPPs).

Statistical Analysis

Analysis of the gathered data was performed through Microsoft Excel and Statistical Package for Social Sciences (SPSS) for quantitative data analysis. In Microsoft Excel, descriptive statistics were used to analyze the respondents' sociodemographic and medical profiles and to summarize their COVID-19 IPPs. In reporting the comorbidities, the respondents had the option of checking all that applied; Hence the total number of responses for all comorbidities did not correspond to the total number of respondents. In summarizing the COVID-19 infection prevention practices, the mean scores of each infection prevention practice were obtained based on the 5-point Likert scale and interpreted as never, rarely, sometimes, often, always, with a scoring from 1 to 5, with 5 corresponding to always.[15] In SPSS, Spearman's rank correlation and Pearson's chi-square tests were performed to determine the association between the respondents' sociodemographic profile and their corresponding infection prevention practice score.[10,16] Spearman's rank correlation test was applied to respondents' overall mean score and their age. Pearson's chi-square tests were applied to the respondents' overall mean score and their sociodemographic and medical profile (sex, educational attainment, marital status, residence, living arrangement, and comorbidities). Responses with incomplete answers to items were removed from the final analysis. A total of 115 responses were recorded, and only 112 were considered valid based on the said criteria, corresponding to 33% of the sample size computed.

Ethical Safeguards Performed

Prior to data collection, a letter containing the study's protocols and procedures was sent to and approved by the University Research Ethics Office (UREO) of Ateneo de Manila University on July 14, 2022. Additionally, the respondents were informed regarding the purpose of the study, the risks and benefits of participating in the study, voluntary participation, and the confidentiality and anonymity of their identities. Before the survey began, each participant's consent was obtained. The study was then administered from July 21 to October 20, 2022. The researchers had access to the data during the data collection up until the finalization of data analyses.

Results

Out of 112 respondents, the majority were between ages 30-50 (52.68%), female (71.43%), with college (83.93%) as their highest educational attainment, single (70.54%), and with no known comorbidities (66.07%). Most resided in NCR (75.00%), whereas the majority lived in Pasig City (35.71%) in a multi-person household (83.93%). Among the 94 respondents living in multi-person households, 72 (76.5%) respondents lived with people of familial ties. Additionally, 56 out of 94 (59.6%) respondents living in a multi-person household lived with at least one member considered a high-risk individual (i.e., senior citizens, individuals with comorbidities). A majority (66.07%) reported no comorbidities. However, among those with comorbidities, heart conditions (19.64%) were the ones reported the most (Table 1).

Table 1. Sociodemographic and medical profile of respondents.

	N = 112	%
Age		
<30	51	45.54%
30-50	59	52.68%
>50	2	1.79%
Total	112	100%
Biological Sex		
Female	80	71.43%
Male	32	28.57%
Total	112	100%
Highest Educational Attainment		
High school	4	3.57%
Vocational	2	1.79%
College	94	83.93%
Post-graduate (Masters, Doctorate)	12	10.71%
Total	112	100%
Marital Status		
Single	79	70.54%
Married	30	26.79%
Separated	2	1.79%
Widowed	1	0.89%
Total	112	100%
Current Residence		
NCR – Pasig City	40	35.71%
Region IV-A – CALABARZON	23	20.54%
NCR – Quezon City	13	11.61%
NCR – Mandaluyong City	9	8.04%
NCR – Manila City	6	5.36%
Region III – Central Luzon	5	4.46%
NCR – Marikina City	4	3.57%
NCR – Caloocan City	4	3.57%
NCR – Taguig City	3	2.68%
NCR – Pasay City	2	1.79%
NCR – Valenzuela City	1	0.89%
NCR – Parañaque City	1	0.89%
NCR – Malabon City	1	0.89%
Total	112	100%
Living Arrangement		
Multi-person household	94	83.93%
With familial ties (e.g., living with a spouse or children)	72	
Without familial ties (e.g., living with a partner or others related or unrelated)	22	
Living with high-risk individuals (e.g., senior citizen, with comorbidities)	56	
Not living with high-risk individuals	39	
Single-person household (e.g., living alone)	18	16.07%
Total	112	100%
Comorbidities (Check all that apply)		
None	74	66.07%
Heart conditions (e.g., high blood pressure)	22	19.64%
Others	12	10.71%
Chronic lung disease (e.g., asthma, COPD, cystic fibrosis, etc.)	6	5.36%
HIV infection	2	1.79%
Neurological conditions (e.g., dementia, etc.)	1	0.89%
Chronic kidney disease	1	0.89%
Cancer	0	0%
Total	118	-

Among the COVID-19 IPPs, the respondents most often practice mask-wearing (4.92) and respiratory etiquette such as covering the mouth and nose when coughing and sneezing (4.90). These were followed by hand hygiene (4.71), environment disinfection (4.53), and avoidance of face-touching (4.36). On the other hand, reducing unnecessary outings (3.81), not drinking alcohol (3.81), and sleeping at least seven hours a day (3.42) were only sometimes performed (Table 2).

Results showed that only age and having chronic kidney disease as a comorbidity correlate with infection prevention practices with a p-value of <0.05. Age showed a significant positive relationship with infection prevention practices ($r=0.25$), while having chronic kidney disease showed a significant correlation ($p=0.038$) There were no significant correlations between biological sex, educational attainment, marital status, living arrangements, and other comorbidities of the respondents with the performance of infection prevention practices (Table 3). The 30-50 age group garnered the highest infection prevention practice scores (4.714) based on the mean infection prevention practice scores of respondents according to age (Table 4).

Table 2. Summary of respondents' COVID-19 infection prevention practices.

Item	Mean Score ± SD	Interpretation
1. I always wear a face mask whenever I am not at home.	4.92±0.30	Often
2. I cover my mouth and nose when coughing or sneezing.	4.90±0.33	Often
3. I clean my hands with an alcohol-based sanitizer.	4.80±0.48	Often
4. I am practicing proper handwashing to prevent the spread of COVID-19.	4.78±0.58	Often
5. I use hand sanitizer more often during the COVID-19 outbreak.	4.71±0.72	Often
6. I wash my hands whenever I am not at home.	4.55±0.67	Often
7. I clean and disinfect items that can easily be touched with hands.	4.53±0.67	Often
8. I don't smoke.	4.46±1.11	Often
9. I avoid touching my eyes, nose, and mouth.	4.36±0.83	Often
10. I practice 1-meter physical distancing to prevent the spread of COVID-19.	4.17±0.85	Often
11. I maintain a healthy lifestyle.	4.14±0.90	Often
12. I reduce unnecessary outings (meetings, dining, shopping, sports activities).	3.81±1.13	Sometimes
13. I don't drink alcohol.	3.81±1.07	Sometimes
14. I sleep at least 7 hours per day.	3.42±1.08	Sometimes
Overall	4.38±0.21	Often

Table 3. Association of the respondents' sociodemographic and medical profile with their COVID-19 infection prevention practices.

Sociodemographic and Medical Profile	Infection Prevention Practices	
	r	p
Age**	0.25*	0.009
Biological Sex***	-	0.055
Educational Attainment***	-	0.106
Marital Status***	-	0.953
Living Arrangement***	-	0.050
High-risk household member***	-	0.097
Comorbidities***		
Cancer	-	-
Chronic Kidney Disease	-	0.038*
Chronic Lung Disease	-	0.921
Heart Conditions	-	0.765
Neurological conditions	-	0.914
HIV infection	-	0.833
Others	-	0.752
No comorbidities	-	0.466

*Correlation is significant at the 0.05 level, **Spearman's rank correlation, ***Pearson's chi-square

Table 4. Mean infection prevention practice scores of respondents according to age .

Sociodemographic Profile Infection	Prevention Practices (Mean)
Age	
<30	4.324
30-50	4.714
>50	4.424

Discussion

The infection prevention practices most often performed by the study respondents were face mask-wearing, performing coughing and sneezing etiquette (respiratory etiquette), and handwashing and sanitizing. The least performed were reducing unnecessary outings, not drinking alcohol, and sleeping at least seven hours a day. Sociodemographic and medical factors shown to have a correlation with IPP were age and having chronic kidney disease (CKD) as a comorbidity.

Infection Prevention Practices (IPP)

The infection prevention practices often practiced by the respondents are included in the minimum IPPs under the CDC's Standard Precautions as the following: use of personal protective equipment, hand hygiene, and respiratory etiquette.[18] The high mask-wearing adherence among respondents may be attributed to the Philippine national government and the Department of Health mandate of publicly wearing masks, where failure to comply could require offenders to pay fines and prohibit their entry into establishments. The country became active in producing personal protective equipment (PPE), with around 80 million face masks produced every month, which increased its availability and accessibility for the people.[19] Similarly, the production of disinfectants, namely rubbing alcohol, hand sanitizers, and cleaning materials, had increased as these products are often freely offered in establishments. With this rising awareness of hand hygiene, the Department of Education and the Department of Health took the pandemic as an opportunity to promote handwashing by spreading good practices in school, community, and workplace settings. Instilling this culture in the long run can help prevent the transmission of other diseases, such as diarrheal diseases, acute respiratory infections, and stunting in the Philippine setting.[20] In social media, handwashing had also been framed as a selfless act that can save lives. Hence, social pressure could have also motivated people to practice hand hygiene.[21]

The respondents' practice of respiratory etiquette may be related to the stigma attached to coughing and sneezing, as individuals may be perceived as infected with COVID-19. This altered perception may have stemmed from fear and anxiety of contamination or infection, despite the frequent symptoms of allergies and the common cold.[22] On the other hand, results showed that lifestyle-related IPP such as reducing unnecessary outings, avoiding alcohol consumption, and getting sufficient sleep were among the least performed by respondents.

Reduction of unnecessary outings was initially employed to control transmission and buy time for medical staff and all those affected to prepare for the pandemic, and it was easier to follow these restrictions during the period of lockdowns. However, as establishments reopened and restrictions decreased, more people have returned to their pre-pandemic lifestyle. Lifestyle measures for maintaining adequate immune function, such as smoking reduction, alcohol consumption limitation, and sufficient sleep, were also the least practiced IPPs among respondents despite being beneficial in preventing COVID-19.[23] Furthermore, IPP promotional materials overlooked the significance of lifestyle measures, as most were focused on proper handwashing, respiratory etiquette, social distancing, and PPE use.

Sociodemographic and Medical Factors Affecting IPP

Among the sociodemographic and medical factors explored, age and having chronic kidney disease (CKD) as a comorbidity were found to have a significant correlation with IPP. Moreover, adherence to IPP was highest among the 30-50 age groups. Age was found to have an association with the knowledge, attitudes, and practices towards COVID-19.[5] The 30-50 age group was also more often found to take the recommended precautionary measures compared to the younger generations. This disparity may have been influenced by a person's perceived severity of the disease. Young adults may perceive themselves as recipients of a less severe COVID-19 outcome and therefore hold fewer concerns over contracting the virus, causing lower adherence to IPP. However, IPP must still be promoted to this generation, not only to protect themselves but also the more vulnerable groups. Meanwhile, the elderly population exhibited higher compliance as the harsher consequences of the virus on them were greatly highlighted in the media.[24] They have been widely considered among the most vulnerable groups; Hence, public authorities focused on their compliance with IPP to effectively minimize the number of deaths.[25]

A study by Haw, et al. (2020) identified the epidemiological profile of COVID-19 cases in the Philippines, where 24.7% were healthcare workers. COVID-19 disproportionately affected older adults as the median age for cases was 46 years old, where deaths were also more likely in the older group.[26] Another study by Velasco, et al. (2022) profiled breakthrough infections, which found that most cases were in the 30-39 age group.[27] Notably, a binary logistic regression model on COVID-19 cases in the Philippines showed an increased risk of mortality of 1.096 per year of age. Those aged 60 years old and above are 8.15 times more likely to die compared to those aged below 60 years old, possibly due to the presence of comorbidities among older patients.[28]

A meta-analysis by the ERA-EDTA Council (2020) found that chronic kidney disease was among the most prevalent risk factors for severe

COVID-19 worldwide and is known to have strong associations with infection.[29,30,31] A study reported in-hospital deaths to have occurred in 25% of the 68 participants with CKD admitted to a Philippine hospital. In addition, patients needing dialysis had difficulties in practicing proper social distancing measures, making them more vulnerable to COVID-19 infection.[32] Participants with CKD displayed a higher level of risk perception toward COVID-19 in a study in South Korea; Hence they practiced face mask-wearing and hand hygiene more frequently compared to the general population.[33] Similarly, a study on the risk aversion behavior of CKD patients found that hygiene-related behavioral changes significantly increased during the first observed visit to the hospital, and only mask-wearing did not decrease in the second observed visit.[34]

Implications of IPP Implementation in Healthcare Settings

The sociodemographic and medical profile of the respondents provides insight into the possible risk factors for infections among hospital employees, which can motivate the improvement of IPP implementation. Similar with the results of the current study, Gholami, et al. (2021) found that the mean age of healthcare workers was 38.73 years.[35] They suggested that the clinical characteristics of healthcare workers likely reflect the same age group. It was also found that 18.4% of healthcare workers infected with COVID-19 had pre-existing comorbidities, which increased the risk of symptomatic COVID-19 and a worse prognosis.[35,36] By monitoring risk factors among employees, hospital employers can be prompted to develop comprehensive occupational health policies and vulnerability risk assessments to protect high-risk employees.[37]

Changes in lifestyle and behavior were the least performed IPPs among the respondents, which could suggest opportunity to emphasize its importance in future campaigns. In terms of implementation and dissemination of IPP in the hospital, Alhumaid, et al. (2021) found that necessary and comprehensive infection prevention and control training was significantly less accessible to healthcare workers other than physicians and nurses despite having significant exposure to hospital procedures and patients.[4] These findings suggest a potential disparity in IPP knowledge management among hospital healthcare workers that can be explored. Countries such as the Philippines struggle with IPP implementation due to factors including inadequate training among healthcare workers, non-prioritization among hospital management, insufficient monitoring, and limited infection prevention resources.[38,39]

WHO (2016) recommends integrating team and task-based infection prevention education and training for all healthcare workers.[40] In a study by Qureshi, Chughtai, and Seate (2022), classroom-based approaches were the primary method used to train healthcare workers on infection prevention and control. However, participants raised issues that this training approach needs to allow for real-time feedback.[39] Silva, et al. (2021) suggested maximizing digital literacy and the availability of electronic platforms as a strategy to disseminate IPP information.[41] These approaches need to be designed according to the competencies and resources available to healthcare workers.

There is also a call for more focus on understanding the factors that impact the delivery of infection prevention and control training. A review by Houghton, et al. (2020) suggests that institutional support, effective communication of infection prevention and control guidelines, physical environment, and availability of PPE were organizational factors that determine healthcare workers' adherence to infection prevention and control.[42] All the mentioned factors may be considered in formulating training strategies that target healthy lifestyles among the study population.

Limitations

This study was conducted at the height of the pandemic, so some limitations must be acknowledged. Given that these surveys were conducted online, the group had to rely on self-reported, instead of observed practices. The group was unable to verify if these practices were affected or not affected by social desirability bias. It is also worth noting that there was stringent implementation of public health protocols at the time the study was conducted, so the respondents' current infection prevention practices might not have been accurately reflected at that point in time. Given that only 33% of the target sample size was reached, the recommendations and findings of this study only apply to the respondents of the selected Level 3 medical center in the NCR and cannot be generalized to the study population. Only one responded with CKD under comorbidities. The 30-50 age group, which was found to have the highest adherence to IPP, also constituted about half of the study respondents with 52.68%. On the other hand, Thus, groups maybe markedly over and underrepresented in the study.

Conclusion

Despite its limitations, the study findings may provide preliminary insight into the sociodemographic and medical factors that may influence the implementation and adherence to hospital-based infection prevention practices. Among the employees of the Level 3 medical center in the NCR, the infection prevention practices most often performed are face mask-wearing, performing cough and sneezing etiquette, handwashing, sanitizing, and disinfecting easily touched items. The least performed were smoking reduction, avoidance of touching parts of the face, social distancing, maintenance of a healthy lifestyle, reducing the amount of unnecessary outings, limiting alcohol intake, and sleeping for at least 7 hours per day, despite being known as practices that help prevent becoming infected with COVID-19. Sociodemographic and medical factors shown to have a significant relationship with IPP were age and having CKD as a comorbidity. With an awareness of the sociodemographic and medical profile and IPP, focused interventions and training can improve adherence to infection prevention and protect high-risk healthcare workers.

Recommendations

The area of study would benefit from expanding the scope to different health facilities and healthcare employees. Additionally, since the study focused on a health facility, expanding to non-health facilities may also be beneficial. Further research into ongoing implementation of infection prevention practices in both private and public health

facilities and possible associations with infection mitigation in the Philippines is recommended. Protective interventions that consider the sociodemographic and medical risk factors of hospital-based employees, may be scoped and explored in local contexts. This includes the administration of focused group discussions with hospital and health facility-based employees on experiences in implementing IPP, particularly barriers to effectiveness. Insights can inform the improvement of health facility IPP interventions, including occupational policies that protect healthcare employees from unnecessary health risks.

Acknowledgments and Conflict of Interest Statement

This study was internally funded. The authors have no financial relationships relevant to this article to disclose. The authors have no conflicts of interest relevant to this article to disclose.

References

1. Nguyen L, Drew D, Graham M, et al. COVID-19 and social distancing. Journal of Public Health 2020; 30(1): 259–61. https://doi.org/10.1007/s10389-020-01321-z
2. Al Jazeera. Philippines health workers protest as COVID strains hospitals. Coronavirus Pandemic News | Al Jazeera. 2021, September 1. https://www.aljazeera.com/news/2021/9/1/philippines-health-workers-protest-as-covid-strains-hospitals
3. Bandyopadhyay S, Baticulon RE, Kadhum M, et al. Infection and mortality of healthcare workers worldwide from COVID-19: a systematic review. BMJ Global Health 2020;5:e003097. http://dx.doi.org/10.1136/bmjgh-2020-003097
4. Alhumaid S, Al Mutair A, Al Alawi Z, Alsuliman M, Ahmed GY, Rabaan AA, Al-Tawfiq JA & Al-Omari A. Knowledge of infection prevention and control among healthcare workers and factors influencing compliance: a systematic review. Antimicrob Res Infect Control 2021; 10(1). https://doi.org/10.1186/s13756-021-00957-0
5. Wake AD. Knowledge, Attitude, Practice, and Associated Factors Regarding the Novel Coronavirus Disease 2019 (COVID-19) Pandemic. Infect Drug Resist 2020; 13: 3817-32. https://doi.org/10.2147/IDR.S275689
6. Department of Health. Strengthening of Hospital Infection Prevention and Control Measures to Prevent Spread of Novel Coronavirus. Department of Health. 2020
7. World Health Organization. Coronavirus Disease (COVID-19) technical guidance: Infection prevention and control / WASH. World Health Organization 2020 Retrieved December 22, 2022, from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/infection-prevention-and-control/
8. Bautista AP, Balibrea D & Bleza DG. Knowledge, attitude and practice toward the Coronavirus Disease (COVID-19) outbreak among selected employed people in the National Capital Region, Philippines. Asian J Public Opin Res 2020; 8(3): 1-8. doi: 10.15206/ajpor.2020.8.3.324
9. Bichara B., De Leon JY, Lomibao JA, Pacursa G., Santos VP, Teaño AM, Tiu HL, Jose JE. Assessing the knowledge, attitude, and practices of college students in Manila, Philippines regarding COVID-19 preventive measures. Int J Progr Res Sci Eng 2021; 2(8).
10. Tuppal CP, Ninobla MMG, Ruiz MGD, et al. Knowledge, attitude, and practice toward COVID-19 among healthy population in the Philippines. Nurse Media J Nurs 2021; 11(1): 61-70. https://doi.org/10.14710/nmjn.v11i1.36067
11. Ashinyo ME, Dubik SD, Duti V, Amegah KE, Ashinyo A, Asare BA, Ackon AA, Akoriyea SK & Kuma-Aboagye P. Infection prevention and control compliance among exposed healthcare workers in COVID-19 treatment centers in Ghana: A descriptive cross-sectional study. PLOS ONE. 2021; 16(3): e0248282. https://doi.org/10.1371/journal.pone.0248282
12. Desta M, Ayenew T, Sitotaw N, Tegegne N, Dires MT & Getie M. Knowledge, practice and associated factors of infection prevention among healthcare workers in Debre Markos referral hospital, Northwest Ethiopia. BMC Health Serv Res 2018; 18(1). https://doi.org/10.1186/s12913-018-3277-5
13. Wee LEI, Conceicao EP, Tan JY, et al. Unintended consequences of infection prevention and control measures during COVID-19 pandemic. Am J Infect Control 2020; 49(4): 469-77. https://doi.org/10.1016/j.ajic.2020.10.019
14. Yuan Y, Deng Z, Chen M, Yin D, Zheng J, Liu Y & Liu X. Changes in mental health and preventive behaviors before and after COVID-19 vaccination: A propensity score matching (PSM) study. Vaccines 2021; 9(9): 1044. MDPI AG. Retrieved from http://dx.doi.org/10.3390/vaccines9091044
15. Shahnazi H, Ahmadi-Livani M, Pahlavanzadeh B. Assessing preventive health behaviors from COVID-19: a cross sectional study with health belief model in Golestan Province, Northern of Iran. Infect Dis Poverty 2020; 9: 157. https://doi.org/10.1186/s40249-020-00776-2
16. Arceo E, Jurado JE, Cortez LA, et al. Understanding COVID-19 preventive behavior: An application of the health belief model in the Philippine setting. J Educ Health Prom 2021; 10. doi: 10.4103/jehp.jehp_1441_20
17. Prasetyo YT, Castillo AM, Salonga LJ, Sia JA and Seneta JA. Factors affecting perceived effectiveness of COVID-19 prevention measures among Filipinos during enhanced community quarantine in Luzon, Philippines: Integrating protection motivation theory and extended theory of planned behavior. Int J infect Dis 2020 Oct; 99: 312-23. Published online 2020 Aug 6. doi: 10.1016/j.ijid.2020.07.074
18. Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, Division of Healthcare Quality Promotion. (2016). Guide to infection prevention for outpatient settings: Minimum expectations for safe care.
19. Department of Trade and Industry. The Philippines unveils unique advantages in COVID-critical PPE and medical supplies manufacturing at Japanese business event. Department of Trade and Industry. 2021, February 19. Retrieved December 21, 2022, from https://www.dti.gov.ph/archives/news-archives/japanese-manufacturing-ppe-medical-supplies
20. UNICEF Philippines. DepEd, DOH commit to create culture of handwashing in schools and communities amid covid-19 pandemic. UNICEF Philippines. 2021, October 21. Retrieved December 21, 2022, from https://www.unicef.org/philippines/press-releases/deped-doh-commit-create-culture-handwashing-schools-and-communities-amid-covid-19
21. Lasco G. The Global Handwashing Partnership. 2020, April 10. Retrieved December 21, 2022, from https://globalhandwashing.org/hand-hygiene-could-covid-19- permanently-change-hand-hygiene/
22. Bouayed J. Sorry, I am sneezing and coughing but I do not have COVID-19. Brain, Behavior, and Immunity. 2022, March. Retrieved December 21, 2022, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8711136/
23. Lange KW, Nakamura Y. Lifestyle factors in the prevention of COVID-19. Global Health J 2020; 4: 146-52. Doi: 10.1016/j.glohj.2020.11.002
24. Luo YJ, Cheng Y, & Sui MX. The moderating effects of perceived severity on the generational gap in preventive behaviors during the COVID-19 pandemic in the U.S. Int J Environ Res Public Health 2021; 18(4). https://doi.org/10.3390/ijerph18042011
25. Daoust, JF. Elderly people and responses to COVID-19 in 27 countries. PLOS ONE. 2020, 15(7). https://doi.org/10.1371/journal.pone.0235590

26. Haw NJL, Uy J, Sy KTL, Abrigo MRM. Epidemiological profile and transmission dynamics of COVID-19 in the Philippines. Epidemiol Infect 2020; 148. https://www.cambridge.org/core/journals/epidemiology-and-infection/article/epidemiological-profile-and-transmission-dynamics-of-covid19-in-the philippines/FF71A51A25F004AC59885AFA4C88C48B
27. Velasco JM. Clinical characterization of COVID-19 breakthrough infections. Phil J Clin Viro 2022; 150–1. https://doi.org/10.1016/j.jcv.2022.10515.
28. Medina MA. Age as a risk factor of COVID-19 Mortality in the Philippines. SSRN. 2020. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3579145
29. ERA-EDTA Council. Chronic kidney disease is a key risk factor for severe COVID-19: A call to action by the era-EDTA. Nephrology Dialysis Transplantation 2020; 36(1): 87–94. https://doi.org/10.1093/ndt/gfaa314
30. McDonald HI, Thomas SL, Millett ERC, & Nitsch D. CKD and the risk of acute, community-acquired infections among older people with diabetes mellitus: A retrospective cohort study using Electronic Health Records. Am J Kidney Dis 2015; 66(1): 60–8. https://doi.org/10.1053/j.ajkd.2014.11.027
31. Wang J, Zhang L, Yang Z, Liu J, & Guo, W. Related factors and economic burden evaluation of nosocomial infection in patients with chronic kidney disease. Contrast Media Molecular Imaging 2022; 1–11. https://doi.org/10.1155/2022/9889917
32. Tomacruz ID, So PN, Pasilan RM, Camenforte JK, & Duavit M. Clinical characteristics and short-term outcomes of chronic dialysis patients admitted for COVID-19 in Metro Manila, Philippines. Int J Nephrol Renov Dis 2020; 14: 41-51. https://doi.org/10.2147/IJNRD.S287455 https://www.sciencedirect.com/science/article/pii/S1386653222000907
33. Kim Y, Lee I, Lee J, et al. First snapshot on behavioral characteristics and related factors of patients with chronic kidney disease in South Korea during the COVID-19 pandemic (June to October 2020). Kidney Res Clin Pract 2022; 41(2): 219–30. https://doi.org/10.23876/j.krcp.21.065
34. Kang MW, Kim YR, Lee IN, et al. Longitudinal behavioral changes and factors related to reinforced risk aversion behavior among patients with chronic kidney disease during the COVID-19 pandemic. Scientific Reports 2022; 12. https://doi.org/10.1038/s41598-022-19787-0
35. Gholami M, Fawad I, Shadan S, Rowaiee R, Ghanem H, Khamis AH and Ho S. COVID-19 and healthcare workers: A systematic review and meta-analysis. Internation J Infect Dis 2021; 104: 335-46.
36. Sanyaolu A, Okorie A, Marinkovic C, et al. Comorbidity and its impact on patients with COVID-19. SN Compr Clin Med 2020; 2: 1069–76. https://doi.org/10.1007/s42399-020-00363-4
37. Ratshikhopha E, Muvhali M, Naicker N, Tlotleng N, Jassat W & Singh T. Disease severity and comorbidities among healthcare worker COVID-19 admissions in South Africa: A retrospective analysis. Int J Environm Res Public Health 2022; 19(9): 5519. https://doi.org/10.3390/ijerph19095519
38. de Claro V, Bautista N, Torralba MR, Castro VV, Lucero MA, Molleno LJ, Stan L. Infection prevention and control preparedness among public hospitals and Covid-19 temporary treatment and monitoring facilities in the Philippines. MedRxiv. 2022; https://doi.org/10.1101/2022.05.11.22274966
39. Qureshi M, Chughtai A & Seale H. Supporting the delivery of Infection Prevention and control training to healthcare workers: Insights from the sector. Healthcare 2022; 10(5): 936. https://doi.org/10.3390/healthcare10050936
40. World Health Organization. Guidelines on Core Components of Infection Prevention and Control Programmes at the National and Acute Health Care Facility Level 2016. World Health Organization. 2016. Retrieved December 24, 2022, from https://apps.who.int/iris/bitstream/handle/10665/251730/9789241549929-eng.pdf;jsessionid=D19D4759240F76F38F9324C39429AA84?sequence=1
41. Silva MT, Galvao TF, Chapman E. Dissemination interventions to improve healthcare workers' adherence with infection prevention and control guidelines: a systematic review and meta-analysis. Implementation Science 2021; 16: 92. https://doi.org/10.1186/s13012-021-01164-6
42. Houghton C, Meskell P, Delaney H, Smalle M, Glenton C, Booth A, Chan, XH., Devane D & Biesty LM. Barriers and facilitators to healthcare workers' adherence with Infection Prevention and Control (IPC) guidelines for respiratory infectious diseases: A rapid qualitative evidence synthesis. Cochrane Database of Systematic Reviews 2020; (8). https://doi.org/10.1002/14651858.cd013582