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Original Research

Knowledge Attitude and Practice on Infection Prevention and Control of Healthcare Workers During Covid-19 In A Tertiary Hospital

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Abstract:

Health care workers are the first to be on the front lines of the epidemic. Increased infection and mortality rates among health care workers will paralyze a country's response to the COVID-19 epidemic, and it will certainly have a significant long-term impact on health care delivery, especially in health systems that are already struggling with workforce shortages due to lack of skilled personnel, skilled labor migration, and geographic location. Assessing IPC knowledge, attitude, and practice remains important in determining the level of compliance with IPC measures.It is in this context that our study aims to assess the knowledge, attitude, and practice of health care workers at Befelatanana University Hospital. Our population was predominantly female (n= 60; 57%) with a sex ratio of 0.76. The average age was 28 years with an extreme age of 21 and 57 years. More than a third of the staff interviewed were residents (n=42; 39.62%), followed by nurses and midwives. More than half had less than 5 years of work experience (n=60; 56.82%) and more than half also reported no training in ICC (n=63; 59%). The majority of health workers (n=103; 97.17%) had previous contact with a suspected and confirmed case (Covid-19). Of the health workers (n=69; 65.09%) contracted Covid-19 of which (n=62; 59%) were confirmed cases and (n=7; 6%) were suspected cases

Our study revealed that more than one third of the participants had insufficient knowledge of hand hygiene (34.91%), almost half of the participants (42.45%) had insufficient knowledge of wearing PPE, insufficient knowledge of donning (35.85%), insufficient knowledge of removal (42.45%). We noted the non-compliance of IPC measures in their practices: the majority reported using surgical masks for more than 4 hours, very few CHWs (n=17; 21%) changed their masks every 8 hours and 29 (36%) . Only 37.71% (n=40) of participants performed a leak test on their FFP2 masks.The majority of staff (98.11%) reported using the gowns; half of the staff (53.17%) did not wash the cloth gowns. We found noncompliance in the use of face shields: 95.3% discarded face shields and 88.7%. We identified factors associated with contamination of healthcare workers, namely midwives/nurses, physicians, residents, and specialty residents, lack of knowledge of hand washing with alcohol-based disinfectant, lack of knowledge of the indication for gowns as universal precautions. Knowledge and skill deficiencies in terms of IPC during Covid- 19 was observed in our study. Thus, establishing a national IPC program and strengthening the training of health workers remains crucial to implement IPC measures at all levels of the health structure in order to reduce the spread of infection either before or during an outbreak . This allows each health worker to be better prepared for a potential outbreak.

Keywords : Infection prevention and control, Knowledge attitude and practice, Madagascar, Healthcare worker

Introduction:

Healthcare workers at the Covid-19 treatment center are actively involved in Covid-19 case management and are constantly exposed to the risk of contracting the virus (1). These health care workers are one of the cornerstones in controlling an epidemic. According to the International Health Regulations (2005), infection prevention and control (IPC) measures are one of the essential strategies to address public health threats, as well as guaranteeing the safety of health care workers in health care facilities and providing a means to prevent intra-hospital contamination [2]. According to WHO, 14% of Covid-19 cases involve health care workers [3]. During the WHO-China joint mission on Covid-19, 32,055 laboratory-confirmed cases were reported among healthcare workers from 476 hospitals in China, mainly (88%) from Hubei province [1]. In the Netherlands, at the beginning of the SARS-CoV-2 epidemic, healthcare workers would likely be infected in the community rather than in hospitals [4]. Experts have emphasized that standards such as the World Health Organization's World Health Organization (WHO) minimum requirements must be implemented in the healthcare sector to effectively manage infectious disease threats, especially in low-resource settings where the burden of hospital-acquired infections is high. [5]. Therefore, adherence to IPC measures should be paramount to prevent and control the pandemic and avoid spread of infection in the community as well as nosocomial or cross-contamination of healthcare workers. It is in this context that we are conducting this study which aims to evaluate the knowledge, attitude and practice of prevention and control of SARS-COV-2 infection and to analyze the factors associated with the contamination of health care workers

Methods:

Our study is a CAP survey established according to the WHO questionnaires on ICP Covid-19. It was carried out at the Joseph Raseta Befelatanana University Hospital (CHU-JRB) in all the medical departments among the nursing staff of the CHU-JRB, which are 15 professors and 128 specialists and general practitioners combined, 174 paramedics and volunteers combined and 300 interns and students. It took place over a period of 7 months, from 22 July 2021 to February 2022.

We included all health care personnel who were present at the time of the survey and who gave their consent to participate in the survey.

These staff were either infected or not with Covid-19 according to national case definitions.

We excluded all healthcare personnel who were absent during the survey period (convalescence; mission; leave,...) or who refused to participate in the survey and all other workers not in direct contact with patients (administrative staff; caretaker; electrician...).

Simple random sampling was used. Six hundred and seven staff working in the Joseph Raseta Befelatanana University Hospital. With an estimated 91% of these staff having a good knowledge, attitude and perception of ICP. At a risk α of 5%, and a confidence interval of 95%, our sample size was to have at least 104 staff to include The data collection method is based on a 15-minute face-to-face interview with health care personnel after a telephone appointment has been made. Health professionals: are grouped into three main categories; these are the medical professions, pharmaceutical professionals and medical auxiliaries. Support staff are agents responsible for the maintenance and hygiene of premises in hospitals and medico-social structures. They participate in tasks that ensure the comfort of patients; they do not participate in the care of patients or hospitalized persons but are in contact with patients. The act of care is a coherent set of actions and practices implemented to participate in the restoration or maintenance of a person's health.

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The variables studied were socio-demographic data such as age, sex, professional categories, professional seniority, area of activity, IPC training, percentage of staff infected with Covid-19 with identification of the first contact 14 days ago. We assessed knowledge, attitude, and practice according to the WHO IPC Knowledge Attitude and Practice tool.

Responses were defined as:

- Don't know: when the participant did not answer the questions asked
- Always: these were participants who used the designated material or product on a daily basis and applied it to any procedure.
- Often: these were participants who ensured daily use, but did not apply it to all acts.
- Rarely: these were participants who used the designated material or product more than once a week.
- Never: These were participants who never used the designated material or product.
- For the assessment of knowledge, the knowledge score will be defined as the following scale
- Poor: less than 25% correct answers
- Insufficient: 25 - 50% correct answers
- Average: 50 - 70% correct answers
- Good: more than 70% correct answers
- For the assessment of practice, compliance of practice is assessed as compliant if health workers always or often respond and non-compliant if they rarely or never respond according to the Likert scale response

These staff were either infected or not with Covid-19 and met the following national case definitions:

Suspect case: a person who had clinical criteria such as sudden onset of fever with cough or dyspnoea and who worked in the health care sector during the 14 days prior to the onset of symptoms.

Probable case: a patient who met the above clinical criteria AND was in contact with a probable or confirmed case, or was linked to an outbreak of COVID-19. It was also a suspect patient who had chest imagery suggestive of COVID-19.

Confirmed case: a person who had a positive PCR test or a positive SARS-CoV-2 antigenic RDT AND who met the definition of a probable case. It was also an asymptomatic person who had a positive SARS-CoV-2 antigenic RDT and was in contact with a probable or confirmed case.

Statistical analysis The data were analysed using Epi info© 7.2.2 software. Descriptive analysis was performed for quantitative variables using measures of dispersion such as mean, standard deviation, and proportions. The comparison of qualitative variables will be done by the chi² test or the Fischer exact test. Quantitative variables will be compared by the Mann-Whitney-Wilcoxon test. A p-value of <0.05 will be considered as a significance threshold. Statistical analysis will be carried out with Epi Info7.2.2 software.

Results:

We recruited 106 healthcare workers from the University Hospital of Befelatanana out of 607 staff working in the centre, i.e. a participation rate of 17.4%. Our population was predominantly female (n= 60; 57%) with a sex ratio of 0.76. The average age was 28 years with an extreme age of 21 and 57 years. More than a third of the staff surveyed were residents (n=42; 39.62%) followed by nurses and midwives. More than half had less than 5 years of professional experience (n=60; 56.82%) and more than half also declared that they had not received any training in IPC (n=63; 59%). The majority of healthcare workers (n=103; 97.17%) had all been in contact with a suspect and a confirmed case (Covid-19). Of the healthcare workers (n=69; 65.09%) contracted Covid-19 of which (n=62; 59%) were confirmed cases and (n=7; 6%) were suspected cases (Table 1). The first contact within 14 days before the onset of symptoms was mainly outside the family circle (60.95%) (Table 1).

Table 1 Summarises The Characteristics Of The Healthcare Workers Surveyed.

Characteristics of participants	Effectif (n)	Pourcentage (%)
Participation rate	106	17.4
Healthcare workers in direct conact with suspected and confirmed cases	103	97.17
Caregivers not in direct contact	3	2.83
Mean age	28 ans (min= 21, max= 57)	
Gender		
Female	61	57
Male	45	43
Professional category		
Internal medecine	42	39.62
Specialized Internal medecine	18	16.98
Physicians	6	5.66
Nurses	35	33.02
Support staff	5	4.72
Professional experience		
Less than 5 years	60	56.82
5 to 10 years	29	27.27
More than 10 years	17	15.91
Department of activity		
Department of Medecine	96	91.09
Intensive care	4	3.96
Paediatrics	6	5.23
Infected Healthcare workers	69	65.09
Confirmed cases	62	59.00
Suspected cases	7	6.60
Healthcare staff non infected	32	30.19
Healthcare staff do not know status	5	4.72
Training in infection prevention Control		
Healthcare workers trained	42.23	41
Healthcare workers untrained	60.77	59
Duration of training		
More than 2 Hours	54.59	53
Less than 2 Hours	48.41	47
First contact Covid-19 within 14 days before symptoms		
Family Circle	24	22.83
Other than family Circle	65	60.95
Unknown	17	16.19

More than a third of the participants have insufficient knowledge about hand hygiene (34.91%)Almost half of the participants (42.45%) had insufficient knowledge of wearing PPE.

Good knowledge of donning (42.45%) and doffing (48.11%), insufficient knowledge of donning (35.85%), insufficient knowledge of doffing (42.45%)

Table 2 Knowledge score

Table 2: Distribution of health workers according to knowledge score Knowledge score Good knowledge				
Knowledge score	High Knowledge (more than 70% correct answer) n(%)	Moderate Knowledge (less than 70% of correct answers) n(%)	Insufficient knowledge (less than 50% of correct answer) n(%)	Poor knowledge (less than 25% of correct answer) n(%)
General of IPC	39(36.79)	20(18.87)	15(14.15)	32 (30.19)
Hand hygiene	15(14.15)	28(26.42)	37(34.91)	26(24.53)
Wearing of PPE	12(11.32)	35(37.91)	47 (42.45)	12(11.32
Chronological order of donning	45(42.45)	00	38(35.85)	23 (21.70)
Chronological order of doffing	51(48.11)	00	45(42.45)	10(9.43)
Generalities on IPC 1/3 have a good knowledge, on hand hygiene and the chronology of donning and doffing				

Almost all participants (n=106; 99%) stated that wearing PPE and hand hygiene are essential.

According to the practice, all participants (100%) stated that they had washed their hands when interacting with a suspected or confirmed Covid-19 patient. Table 3 shows the evaluation of the practice among the health care workers. The majority of them used soap and water when washing their hands (80.19%) (Table 3).

The hand washing technique and the 5 moments of hand hygiene were generally compliant except for the last hand washing step: turning off the tap with the same hand towel (n=73; 68.87%) (Table 3)

Concerning surgical masks, the majority reported using surgical masks for more than 4 hours, almost half did not throw away their masks and 1/3 reused surgical masks (Table 3)

Concerning the use of FFP2 masks, very few healthcare workers (n=17; 21%) change their masks every 8 hours and 29 (36%) throw away their masks and do not reuse them after 8 hours. Only 37.71% (n=40) of the participants performed a leakage test on their FFP2 masks (Table 3).

Regarding the use of gloves, overall compliance was high, with most of the staff surveyed (80.19%) stating that they had used gloves during the pandemic. Only 17 (16.04%) reported irrational use of gloves through double gloving (Table 3).

The majority of the staff (98.11%) reported having used the gowns; half of the staff (53.17%) did not wash the cloth gowns. We noted non-compliance in the use of face shields: 95.3% discarded face shields and 88.7% washed with alcohol before reuse but did not send to decontamination (Table 3).

Table 3 Distribution according to Covid-19 IPC Practice Conformity of Health Workers

	Always compliant or Often n(%)	Non Compliant n(%)
Hanad washing when interacting with suspected or confirmed patients	106(100)	
Hand washing with soap and water	85(80.19)	21(19.81)
Hand washing with Alcohol ahand rub	91(85.85)	15(14.15)
Washing with other products	1(0.94)	105(99.06)
Before touching patient	98(92.45)	8(7.55)
Before aseptics procedures	102(99.02)	1(0.97)
After exposure to body fluids After touching patients	106(100) 106(100)	00 00
After touching patient environment	100(94.34)	6(5.66)
Handwashing technics		
Wet hands thoroughly	102(96.23)	4(3.77)
Apply sufficient soap/SHA (3-5ml)	106(100)	00
Palm to palm friction	103(97.17)	3(2.83)
Friction of back of left hand with palm of right hand, and vice versa	103(97.17)	3(2.83)
Friction of interdigital spaces, palm to palm and fingers interlaced	100(94.34)	6(5.66)
Friction of backs of fingers in palm of opposite hand	98(92.45)	8(7.55)
Friction of fingertips of right hand into left hand, and vice versa	94(88.68)	12(11.32)
Friction of thumb from left hand to right hand and vice versa	93(87.73)	13(12.26)

Rinsing with water	102(96.23)	4(3.77)
Turn off tap with same hand towel	33(31.13)	73(68.87)
Wearing PPE		
Use surgical masks every 4 hour	9(8.49)	97(91.51)
Disposal of masks after use	54(50.94)	52(49.06)
Staff do not reuse masks after use for more than 4 hours	69 (65.09)	37(34.91)
Staff do not reuse masks after use for more than 4 hours	93 (87.74)	13(12.26)
N95 Masks		
Leak test of masks	40(37.71%)	66(62.6%)
Change FFP2 masks every 8 h	17(16.04%)	89(83.96%)
Change FFP2 mask more than 12 hours	21(19.81%)	85(80.19%)
Staff who do not wash and reuse their FFP2 mask	62(58.49%)	44(41.51%)
Staff who discard their mask after 8 hours	29(36%)	77(72.64%)
Use of Gloves		
Gloves uses during Covid-19	85(80.19%)	21(19.8%)
No doublegloving	87(82.07%)	17(16.04%)
Gloves change between patient	67(63.21%)	39(36.79%)
Healthcare workers who do not wash nor reuse gloves	88(83.02%)	17(16.04%)
Hand washing before donning gloves	88(83.02%)	18(16.98%)
Hand washing after removing gloves	104(98.11%)	2(1.89%)
Wearing Gowns		
Healthcare staff who do not discard gowns after use	104(98.11%)	2(1.89%)
Healthcare workers who wash and reuse gowns	49(46.23%)	57(53.77%)
Staff who do not put on the gownws without taking them off	97(91.51%)	9(8.49%)
Faceshields		
Staff who do not discard faceshields after each patient	104(98.11%)	2(1.89%)
Staff who do not throw away face shields after 24 hours of use	5(4.72%)	101(95.28%)
Staff who do not wash faceshields with alcohol before reuse	12(11.32%)	94(88.68%)

After univariate analysis, the factors associated with the contamination of healthcare workers were : midwifes/ nurses, physicians, residents and specialized residents,lack of knowledge of handwashing with alcohol based handrub, lack of knowledge of indication of gowns as universal precautions. The table 4 showed this univariate analysis

Table 4 Factors associated to contamination of healthcareworkers

			Univariate analysis	
	Already infected % (n)	Non infected % (n)	p	OR IC à 95%
Age < 28 ans	64,7 (44)	46,9 (15)	0,09	2 [0,8-4,9]
Midwifes/ nurses	26,1 (18)	53,1 (17)	0,01	0,3 [0,1-0,7]
Residents	46,4 (32)	18,6 (6)	0,008	3,7 [1,4-10,2]
Physicians/Specialized Residents/ Residents	72,5 (50)	37,5 (12)	0,001	4,3 [1,8-10,8]
Support staff	1,5 (1)	9,4 (3)	0,09	0,1 [0,01-1,4]
Female gender	53,6 (37)	67,7 (21)	0,19	0,6 [0,2-1,3]
Professional experience< 10years	83,3 (20)	85 (17)	0,88	0,9 [0,2-4,5]
Infected family member	26,1 (18)	19,3 (6)	0,61	1,4 [0,5-4,1]
Lack of knowledge of IPC	31,9 (22)	21,9 (7)	0,35	1,7 [0,6-4,4]
Lack of IPC training	63,8 (44)	43,8 (14)	0,05	2,2 [1-5,3]
Poor hand hygiene Knowledge	54,6 (12)	68,8 (11)	0,5	0,5 [0,1-2,1]
Lack of knowledge of hand washing with alcohol based handrub	47,8 (33)	25 (8)	0,03	2,7 [1,1-6,9]
Lack of knowledge of indication of gowns as universal precaution	89,9 (62)	68,7 (22)	0,01	4 [1,3-11,8]
Staff are not practicing mask change every 8 hours	91,3 (63)	68,7 (22)	0,005	4,7 [1,6-14,7]

Discussion:

Our study allowed us to evaluate the knowledge, the attitude and the practice of Prevention and Control of Covid-19 infection among the nursing staff in the Hospital Center of Befelatanana. Our population was predominantly young with an average age of 28 years and female (57%) with a professional experience of less than 5 years (56.8%) and especially residents who are exposed to the first rank of Covid-19 patients. More than half (65.09%) contracted Covid-19 during the second wave of the pandemic. Recent data have shown that HCWs are more likely to be exposed to SARS Cov-2 and Covid-19 than the general community, however IPC is the best weapon to protect HCWs from the Covid-19 pandemic (6). According to the results of a systematic review approximately 3.9% of 3,912,156 patients are HCWs (7). However, there is a difference between

Northern and Southern countries on this seroprevalence. A prospective cohort study from March 24 and April 23, 2020, in the United Kingdom, conducted on 2,810,103 users defined as participants who provided baseline information, found a reported prevalence of 2,747 cases of COVID-19 per 100,000 frontline health workers versus 242 per 100,000 in the general community. In the United Kingdom, 1.1% of HCWs reported testing positive for COVID-19 compared with 0.2% of the general community (ratio of HCWs tested to the number of people tested in the community), whereas in the United States, 4.1% of HCWs were tested compared with 1.1% of the general community (ratio: 3.7). After multivariable adjustment, the risk of positive testing was 12 times higher among frontline workers than in the general community (aHR 11-6, 95% CI: 10-9 to 12-3) (6). A meta-analysis of 12 peer-reviewed and four preprinted articles including data on 9223 health care workers from 11 African countries showed highly variable seroprevalence and ranged from 0 to 45.1%. Seropositivity was associated with older age, lower education level, working as a non-clinical nurse/health worker or in gynecology, emergency, outpatient or surgical departments (8).

A Netherlands study showed that it was difficult to draw definitive conclusions about individual HCW or HCW-to-patient cases based solely on sequence data at this early stage of the SARS-CoV-2 epidemic, when the genetic diversity of the circulating pathogen was negligible. In addition, we did not obtain WGS genetic sequences from all health care workers and patients who tested positive (7). Thus, the imputability of the source of infection of health care workers must be analyzed with caution because we do not yet have genetic sequencing of all positive tests between patients and health care workers on the same ward.

The assessment of knowledge about IPC revealed good knowledge about the generality of IPC, but almost half had insufficient knowledge about hand hygiene, wearing PPE and the chronological order of donning and doffing. According to the knowledge score, more than one third had good knowledge on the generality of IPC (36.79%), more than one third had insufficient knowledge on hand hygiene (34.91%), almost half of the partcipants (42.45%) had insufficient knowledge on the wearing of PPE. A descriptive cross-sectional survey of health care workers' knowledge, attitudes, and practices about Covid-19 in a tertiary hospital in Nigeria reported that 97% of partcipants knew about the effectiveness of handwashing in preventing the spread of infection, 74% from them were aware of the importance of face masks

However, a study of health care workers in Tanzanian outpatient facilities concluded that compliance with IPMs was poor (10). The results vary from country to country and depend on the methodology adopted, including self-reporting by health workers or an observational method (11). This lack of knowledge is also explained by the fact that in our study more than half of the health care workers have not received training in IPC. Therefore, knowledge of IPC is essential in the context of a Covid-19 epidemic. Insufficient knowledge of IPC among health care workers should prompt the promotion of effective communication and regular training of health care workers. Follow-up training is necessary to ensure health worker compliance with recommended measures. Incorporating ongoing and regular training in IPC during and outside of an epidemic is necessary to ensure that a good level of learning for all staff.

We found that health workers had a positive attitude about IPC; according to the attitude score, 99% had a good attitude about hand hygiene and wearing PPE. The majority reported adopting a good handwashing technique following the 5 WHO moments. One - third reused surgical masks, and very few changed their FFP2 masks every 8 hours. The use of gowns and face shields did not comply with recommendations. Our result differs from the Nigerian study where 83.7% of the health care workers had good knowledge and 77.6% had good practice in prevention of Covid-19 (12). On the other hand, appropriate practices

were observed among the majority of HCWs on a survey conducted in Venezuela (n = 1,108; 76.9%). Most HCWs always or frequently practice social distancing only half of the HCWs always or frequently comply with the rational use of PPE (13). However, an observational study in Turkey found low compliance with hand hygiene during patient interactions (14). These results are not similar to our study and differ from region to region. Indeed, practices are variable and are correlated with knowledge, training received, availability of personal protective equipment, and access to or inadequacy of materials and equipment in health facilities. During the COVID-19 epidemic, frequent stock-outs and inadequate supplies of PPE were a major challenge for health care workers in Madagascar and other countries (14). It was shown that frontline health workers who reported reusing PPE had a 46% increased risk of having a positive COVID-19 test (aHR 1-46, 95% CI: 1-21 to 1-76), with use of inadequate PPE associated with a comparable 31% increase (aHR 1-31, 95% CI: 1-10 to 1-56) (15). These different shortcomings may explain non-compliant practice in countries where the health system is fragile, and human, material and financial resources are insufficient as reported in our study . Only half of the staff has received training on IPC and the lack of PPE is a problem during the pandemic. The last point may explain the non-compliance of practices in our study.

Thus, setting up a strategic national IPC program by considering the upgrading of materials, equipment and infrastructure and by implementing continuous training on IPC for healthcare workers is one of the major objectives for a better prevention of the spread of infections outside or during an epidemic in low income countries like Madagascar. These deficiencies also contribute to the contamination of health care workers. In this study we identified the factors associated to contamination namely : midwifes/ nurses, physicians, residents and specialized residents,lack of knowledge of handwashing with alcohol based handrub, lack of knowledge of indication of gowns as universal precautions. These result were statistically significant but remain controversial given the small sample size which will be a limitation of our study.

The limitations of our study were the small sample size and the self-reporting of participants on their knowledge and practices. Nevertheless, this study gives us insight into the knowledge and practice of IPC in a resource-limited country like Madagascar and will help improve IPC and thus contribute to better prevention during a future outbreak.

Conclusion :

Our study shows insufficient knowledge about IPC during Covid-19, good practice on hand hygiene but non-compliance on PPE use. Our study was based on a combination of questionnaires and observations conducted on frontline health workers during the epidemic and allowed us to obtain detailed information on deficiencies, knowledge attitudes, and practices of IPC during the Covid-19. Thus, establishing a national IPC program and strengthening the training of health workers remains crucial to implement IPC measures at all levels of the health structure to reduce the spread of infection either before or during an outbreak.

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