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RESEARCH ARTICLE

KNOWLEDGEANDBEHAVIOROF HATTAHOSPITALHEALTHCAREPROFESSIONALSREGARDINGCOVID-19INFECTIONPREVENTIONANDCONTROL

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Abstract

Healthcare-associated infection represents a public health problem in all countries. COVID-19 patients can rapidly overwhelm the capacities of healthcare systems. As more patients are hospitalized, healthcare workers (HCW) at the frontline of care are at the greatest risk of infection. This study aimed to assess the knowledge and self-reported behavior of healthcare professionals in Hatta Hospital regarding COVID-19 infection prevention and control (IPC) during this emerging infectious disease pandemic. A descriptive cross-sectional study was conducted in Hatta hospital, United Arab Emirates (UAE) among one hundred HCWs using a self-administered questionnaire based on UAE National and World Health Organization (WHO) IPC guidelines. Of the study participants, 66% received COVID-19 IPC training inside Hatta hospital. The mean knowledge and behavior scores were 75.7% ± 9.4 and 87.6% ± 5.9, respectively. Knowledge score and behavior score were not related to gender (p= 0.232, 0.091, respectively) and to work position (p= 0.882, 0.994, respectively), however, they were related to the previous contact with COVID -19 patients (p= 001, 0.011, respectively). Nonetheless, gaps in IPC knowledge and behavior have been identified and need improvement. This includes donning and doffing of PPE and optimal use of protective measures especially respirators (N95 or FFP2).

Introduction:-

On 30 January 2020, the World Health Organization (WHO) declared Coronavirus disease2019 (COVID-19) outbreak a PublicHealth Emergency ofInternationalConcern[1]. The COVID-19pandemic,causedbythesevereacuterespiratorysyndromecoronavirus2(SARS-CoV-2),hadbecome a global challenge [2]. COVID-19 had spread worldwide especially with the aid ofcommercial air travel [3]. The spread of COVID-19 was explained by the phenomenon of 'superspreading', whereby a COVID-19 patient may have transmitted the disease to up to eightcontacts [4]. Any delay in the recognition of the disease and the application of effective controlmeasure areas increased the probability of the spread of the virus. The increasing numbers ofCOVID-19 patients could rapidly overwhelm the capacities of healthcare systems. As

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morepatientswerehospitalized,healthcareworkersatthefrontlineofcarewereatthegreatestriskofinfection [5]. Infection control encompassed all the policies, procedures, and measures used toprevent or minimize the risk of transmission of infectious disease in healthcare facilities [6].Appropriatehospitalinfectioncontrolmeasureshavebeenrecentlyshowntopreventnosocomial transmission of SARS-CoV-2 [5]. If infection control measures were not widelyfollowed, healthcare facilities may dramatically speed up the spread of the virus amongst staff[7]. In Italy, 2020 infection rates of healthcare workers were five times that of the generalpopulation [7]. BytheendofthelastEbolaepidemicin WestAfricain2016,the rateofinfectionamonghealthcareworkerswas21to32timesthatofthegeneralpopulation[7].Leftunchecked,the current pandemic could attain comparable levels and lead to the failure of healthcare systems[7].

A positive, correlation was found between knowledge regarding COVID-19 among HCWsand appropriate clinical practices [8]. The contact with confirmed and suspected COVID-19patientsdidnotpromoteself-reportedIPCbehaviorsinlow-riskareas,butinhigh-riskdepartments,IPC behaviorshave significantlyimprovedafter theCOVID-19 outbreak[9].

Very few studies report on the Knowledge and behavior of COVID 19 IPC. A nationalsurvey of UK medical students and interim foundation doctors in 2020 during the COVID-19pandemicshowedthatthelevelsofself-reportedPPEandIPCtrainingweresub-optimal[10].InUAE a study in Al Ain, (2020) indicated that there was a significant gap in knowledge andperception about COVID-19 [11]. However, in UAE and the Middle East, no study has been doneregardingCOVID19IPCknowledge andbehaviorintheHCW.

International health regulations have dictated five public health measures to manage anoutbreak: prevention, detection, response, enabling function, and operational readiness [2]. Thebest approach to control a pandemic was through the simultaneous application of preventivemeasuresandsensitivediagnoses[12].Therefore,thisstudyaimedtoassesstheknowledgeandself-reported behavior of healthcare professionals in Hatta Hospital regarding COVID-19 IPCand toidentifyany gapsthat mightincrease theriskofinfection.

MaterialsandMethods:-

Researchquestions

1. Didhealthcareprofessionals(HCP)inHattaHospitalhaveup-to-dateknowledgeaboutCOVID-19IPC?
2. DidthisknowledgeaffecttheirbehaviorregardingCOVID-19IPCmeasures?

ResearchMethods:-

This is a cross-sectional descriptive study. Comprised of a convenient sample of healthcareprofessionalsworkingatHattaHospitalwho werewillingtoparticipate inthestudy.

Questionnaire

A semi-structured paper-based questionnaire was created by the author after reviewing theUnited Arab Emirates (UAE) national guidelines course materials on emerging respiratoryviruses,includingCOVID-19[13]andWHOIPCguidelines[14,15,16,17]aswellasWHOcommonlyaskedquestionsthat coverall partsrelatedtoCOVID-19IPC[18].

Two infection control experts (qualified infection control consultants at Suez Canal University)who also have access to the materials used for developing the questionnaire have validated thequestionnaire.

Following the validation process, five physicians and ten nurses from Hatta Hospital tested thepilotquestionnairethroughoutthe3rdweekofMay2021toinstituteclarity,easeofcomprehension,andcontentoftheq uestionnaire.Thequestionnairewasthenrevisedaccordingto theraisedconcernsthroughoutthe 4th week ofMay 2021.

The first page of the questionnaire (appendix 1) encompassed a consent form along with anexplanationofthequestionnaire.

Thequestionnairewascomprised ofthreesections:
First:Demographicdata (e.g.,age, gender,yearsofexperience).
Second: Knowledge regarding COVID-19 IPC (e.g., routes of transmission, incubation period,fatality rate, and types of protective measures in different situations). There were thirteenmultiple-choice and rearrangement questions with 1 point to correct answer and zero point toincorrectanswerwithatotalscore of31
Third: Behavior about COVID-19 IPC practice (e.g., frequency of following respiratory hygienepractices, educating patient and relatives about cough and sneeze etiquette, designating staffwho will be responsible for caring for suspected or known COVID-19 patients). It included 31questions withanswers ranging from(never, notatall) to (always, excellent).

Response to each item recorded on the 4-point Likert scale as follows: always or excellent (4-points), most of the time or above average (3-points), average or occasionally (2-points), belowaverage or rarely (1-points), and not at all or never with a total score of 124. A score above 80%wasconsideredasgoodbehavior [19,20].

The definition according to the WHO checklist and adapted by us was that: Always orexcellent means more than 95% of the time. Most of the time or above-average means 50% tounder 95%of the time. Occasionally or average means 20% to less than 50% of the time and rarelyorbelow-averagemeansless than20% ofthetime[14].

Datacollection;
The final paper-based questionnaire was given to the participants in person and administeredbythe respondentsthemselves(self-administered throughoutthe 1stweekofJune2021.

Participants' inclusion criteria: Health care professionals at Hatta Hospital, including doctors,nurses, technicians, and pharmacists. Hatta Hospital staffing at the time of the study: 112 doctors,239 nurses, 99 technicians, and 10 pharmacists. The sample size was at least 80 participantsaccording to thefollowingequation[21].

$$n = \left[\frac{Z_{\alpha/2} * \sigma}{E}\right]^2$$

Where
n= samplesize
Zα/2= 1.96(Thecritical valuethatdividesthecentral95%of theZdistributionfromthe5%inthe tail)
σ=theestimateofthestandarddeviation=1.3
E =the marginoferror(=widthof confidenceinterval)=0.5

Exclusioncriteria:
Otherhospitalstaffanduncompletedquestionnaire.

Ethicalconsiderations
The first page of the questionnaire consisted of an explanation of the aim, objectives, andmethodsofthestudyaswellasaninformedconsenttobeagreedbytheparticipantsbeforetheycanadvance tothequestionnaire.

The participants' identities were kept anonymous, and the collected data was saved in a securefile, and was strictly confidential and used for this research purpose only. Participants wereaware that this study required voluntary participation, and their participation had no bearing ontheirprimary work position.

Theparticipantshadtherighttowithdrawfromthestudyat anytime.

Ethics approval:
The study was performed following the deliberation of the Dubai ScientificResearch Ethics Committee (DSREC) and ethical approval reference number: USRRC-GL-2021-04-03.

DataAnalysis:-

Analysiswasbyfrequenciesandpercentforqualitativedataandmean±standarddeviationforquantitative data (such as age and years of experience). The significance of the relationshipbetween quantitative variables would be tested by one-way analysis of variance (ANOVA) andindependent sample t-test for parametric quantitative data.

Correlation Coefficient was used toassess the strength and direction of the relationships between variables as years of experienceandknowledgescores.Ap-value<0.05wasconsideredstatisticalsignificance.Allanalyseswereconductedusingthe SPSSforWindowsstatisticalpackage 9(version22).

Results:-

One hundred sixty-three health care professionals from Hatta hospital participated in thisstudy. However, only one hundred submitted complete questionnaires and were included inthis study. The description of their demographic profile is shown in Table 1. The mean age was37.9±6.12yearsand57%werefemale.Twenty-eightpercentwerefromtheEmergencyMedicinedepartment, 13% from Family Medicine, 11% from ICU, 9% from Radiology department 7%Surgery and 6% Obstetrics and Gynecology departments, and (2%) ware from the Anesthesiadepartment.Themajority(58%)wereNursesand27%weredoctors.Regardingthemainsourceinformation, 42% use social mdmediacircular hospital announcements, and scientific journals asmain sourcesofinformationTable1 alsocontainstrainingand COVID 19contact.

Table1:-Descriptionofthedemographicprofileofstudyparticipants(n=100).

Characteristics		Values
Age(years)	Mean±SD	37.9± 6.12
	Range	30–59
Gender	Male	43%
	Female	57%
Workposition	Doctor	27%
	Nurse	58%
	Pharmacist	4%
	Technician	11%
Yearsofexperience	Mean±SD	13.5± 5.1
	Range	6– 35
SourcesofinformationregardingCOVID-19infection	Socialmedia	68%
	Circularhospital announcement	66%
	Scientificjournal	55%

Table2:-Shows thepercent ofcorrectknowledgeofallparticipants.Themeanpercentageofcorrectknowledgewas 75.7± 9.4.

	Workshop	27%
	Other	13%
PreviousdirectcarecontactwithCOVID-19patient	No	9%
	Yes	91%
TrainingforCOVID-19infectionpreventionandcontrol	Hattahospitaltraining	65%
	Self-study	44%
	Nationaltraining	10%
	Traininginanother hospital	6%
	Other	4%
	None	10%

Regard the incubation period and fatality rate of COVID-19, 89 (89%) of participants knewthat the incubation period was 1-14 days; and 53 (53%) knew that the fatality rate of COVID-19was 3%. Only 45 (45%) knew about the three most common routes of COVID-19 transmission,whichwerethroughthedroplet,directcontacttransmission,andaerosoltransmission,while51(51%)ofthe participantshadmisunderstandingsregardingwatertransmission.

As regards the aerosol-generating procedure, 54 participants (54%) had known the threemost aerosol-generating procedures i.e the tracheal intubation procedure, nebulizer treatment,and open airway suctiofiftysixty six (56%) of participants had misconception regarding thecollectionofsputum as aerosol-generating procedure.

Assessing the knowledge about protective measures required during triage of suspectedCOVID-19 patients revealed that 59 participants (59%) knew that medical masks should use.Besides,80 participants(80%) have amisconceptionaboutusingrespirators (N95orFFP2).

Regarding the knowledge about protective measures required during transporting of asuspected/confirmedcaseofCOVID-19includingdirectpatientcare,48%knewthefourrecommendedprotectivemeasures,single-usegloves,goggles,andmedicalmasks.Nevertheless,84participants(84%)hadamisunderstandingoftheutilizationof respiratorsasaprotectivemeasure. (Table2)

Table2alsopresentsparticipants'knowledgeabouttypesofPPEsrequiredduringcollectingarespiratoryspecimen.Only forty-oneparticipants(41%)knewthefourrecommended protective measures, the gowns, goggles single-use gloves and medical masksEighty-seven of the participants (87%) misunderstood the utilization of respirators as beingrequired during collecting the respiratory specimen. Among the total participants, 89 (89%)knew about the four most protective measures required during aerosol-generating procedures,which include single-usegloves,respirators, gowns, andgoggles

Regarding knowledge about the approaches that help to prevent transmission of COVID-19,66(66%)knewallfourapproachesthathelptopreventtransmissionofCOVID-19,handhygiene,stayinghome,coveringnoseandmouthwhilecoughing,andrapidassessment.All100participants (100%) believed that hand hygiene was the very essential approach that could helppreventtransmission ofCOVID-19.(Table2)

Regarding correct steps of donning and doffing PPEs, fifty-nine participants (59%) knewand followed the correct donning steps of PPEs. In addition, 58 participants (58%) knew thecorrect doffing steps of PPEs. Concerning knowledge about actions needed in case of concernsregardingabreachofPPE duringpatientcare,only37participants(37%)knewthethreeactionsthat should be taken. These actions include removing and changing PPE away from the patientin71participants(71%),leavingthepatientcareareawhensafetodosoin64participants(64%),reporting it to the direct line manager and infection control unit in 56 participants (56%). (Table2)

Table2:-KnowledgeaboutCOVID-19IPCinstudyparticipants(n=100).

Description	Correctresults
Incubationperiod	89%
Fatalityrate	53%
KnowledgeaboutmostlikelyroutesofCOVID-19transmission	43%
Typesofaerosolsgeneratingprocedures	54%
Typesofprotective measuresrequiredduringtriageofanon-suspectedCOVID-19patient	56%
Typesofprotective measuresrequiredduringtriageofasuspectedCOVID-19Patient	59%
Typesofprotective measuresrequiredduringtransportingofasuspected/confirmedcaseofCOVID-19includingdirectpatientcare	48%
Typesofprotective measuresrequiredduringcollectingarespiratoryspecimen	41%
Typesofprotective measuresrequiredduringaerosol-generatingproceduresonCOVID-19patient	89%
KnowledgeaboutapproachesthathelptopreventtransmissionofCOVID-19	66%
KnowingthecorrectstepsofPPEsdonningtechniques.	59%
KnowingthecorrectstepsofPPEsdoffingtechniques.	58%
Participants'knowledgeaboutactionsthatshould betakenincaseofconcernsregardingabreach ofPPE duringpatientcare.	37%

Mean±SDofKnowledgescore	75.7±9.4

Table3showsself-reportedbehaviorsonthefrequencyofusingPPEsinstudyparticipantsduring a healthcare interaction with a COVID-19 patient. Ninety-two participants (92%) statedthat they always use single-use gloves. About the utilization of surgical masks, the majority ofthe participants always have good behavior in using the surgical mask, which is equivalent to 90participants(90%),while53(53%)hadgoodbehaviorbehusingorregardingusegoggles.seventy-threeparticipants(73%)hadalwaysutilizedgowns.Generally,theseresultsshowedthatthemajorityoftheparticipantshavegoodbehaviorinusingthementionedPPEsduringtheirinteraction with aCOVID-19patient.

Table 4 presented self-reported participants' behavior on the frequency of using PPEsduring an aerosol-generating procedure on a COVID. For single-use gloves, 87 participants (87%)reportedthattheyalwaysusegloves.While76participants(76%)alwaysutilizedtheN95mask. 69participants(69%)alwaysusedgoggles.60participants(60%)alwaysutilizedgowns,whereas, 59 participants (59%) used the apron always. Overall, the majority of the participantshavegoodbehaviortowardstheuseofPPEsduringanaerosol-generatingprocedureonCOVID-19patients.

During a health care interaction with the COVID-19 patient, the self-reported behavior onthefrequencyofperforminghandhygienebeforetouchingthepatientwasperformedalwaysin74participants(74%).Seventy-eightofthem(78%)respondedthattheyalwaysperformedhandhygiene after touching the patient. While, hand hygiene was being performed always before orafteranycleaningorasepticprocedureasperceivedby83participants(83%),handhygieneafterbody fluid exposure was always performed by 75 participants (75%). on the other hand, handhygiene after touching the patient's surroundings was always performed in 71 participants(71%). These results showed good behavior among the studied participants were in a majorityoftenperformedhandhygiene duringtheirinteractionwithCOVI-19patients(Table5)

Regardingtheself-reportedrateoftrainingaboutinfectionpreventionandcontrolregarding the COVID-19 outbreak during the previous 6 months. As regards infection controlpoliciesand procedures training,41participants(41%)ratedaboveaverageandexcellenttrainingfor38participants(38%).Forhandwashtechniques,forty-twoparticipants(42%)rateditbothexcellentandabove-arespectively.AboutN95mask-wearingtechniques,46participants(46%) rated it excellent and above average for 33 participants (33%). On wearing gloves, 46participants (46%) rated it excellent and above average for 43 participants (43%). Concerningwearinggogglesorfaceshieldsratedexcellentby47participants(47%)andaboveaverage in40participants (40%). Regarding the removal and disposal of PPEs, 40 participants (40%) rated itexcellent and above average for 44 participants (44%). The results show that the majority of theparticipants have good behavior regarding training about the COVID-19 outbreak during thelast6months.(Table6)

Table 7 shows the rate of different preventive actions performed to prevent COVID-19.Removing and replacing PPEs according to protocols was always performed in 62 participants(62%). 57 participants (57%) always observed following respiratory hygiene. While on triagepatients for respiratory symptoms, fifty-five participants (55%) always performed it. Keeping aone-meterdistancebetweenthepatients wasalwaysfollowedby58participants(58%).Besides,offeringamedicalmaskforasuspectedCOVID-19patientwasalwaysperformedby67participants (67%). Educating patients and relatives about cough and sneeze etiquette wasalwaysperformedby65participants(65%).Avoidingtouchingeyes,mouth,ornosewasalwaysperformedby76participants(76%).56participants(56%)alwaysreportlimitmovementsuspected/confirmedpatientswithCOVID-19patientsinsideofthefacility.Placingsuspected/confirmed patients with COVID-19 in an isolation room was always followed in 71participants(71%).Furthermore,67participants(67%)alwaysperformedenvironmentaldisinfection after each patient. Reporting to a superior/higher up was always applied in 68participants(68%).

Table 3:- Self-reported behaviors on the frequency of using PPEs during a healthcare interactionwithaCOVID-19patient.

Description		Values
	Mostoftime	8%

Single-usegloves	Always	92%
Surgicalmask	Mostoftime	7%
	Always	90%
Goggles	Mostoftime	28%
	Always	53%
Gowns	Mostoftime	15%
	Always	73%

Table4:-Self-reported behaviorsonthefrequencyofusingPPEsduringanaerosol-generatingprocedureonaCOVID-19 patient.

Description		
Single-usegloves	Mostoftime	6%
	Always	87%
N95mask	Mostoftime	11%
	Always	76%
Goggles	Mostoftime	13%
	Always	69%
Gowns	Mostoftime	26%
	Always	60%
Apron	Mostoftime	22%
	Always	59%

Table5:-Self-reportedbehaviorsonthefrequencyofperforminghandhygieneduringahealthcareinteractionwithaCOVID-19patient.

Description		Values
Performhandhygienebeforetouchingthepatient	Mostoftime	24%
	Always	74%
Performhandhygieneaftertouchingthepatient	Mostoftime	17%
	Always	78%
Performhandhygienebeforeorafteranycleaningorasepticprocedure	Mostoftime	13%
	Always	83%
Performhandhygieneafterbodyfluidexposure	Mostoftime	20%
	Always	75%
Performhandhygieneaftertouchingthepatient'ssurroundings	Mostoftime	18%
	Always	71%

Table6:-Self-reported rateofparticipants'trainingregardingtheCOVID-19outbreakduringtheprevious6months.

Description		Values
Infectioncontrolpoliciesand procedures	Aboveaverage	41%
	Excellent	38%
Handwashingtechniques	Aboveaverage	42%
	Excellent	42%
N95mask-wearingtechniques	Aboveaverage	33%
	Excellent	46%
Wearinggloves	Aboveaverage	43%
	Excellent	46%
Wearinggogglesorafaceshield	Aboveaverage	40%
	Excellent	47%
Removaland disposaloffPPEs	Aboveaverage	40%
	Excellent	44%

Table7:-Self-reported Participants'rateofperformingpreventiveactionsrelatedtoCOVID-19.

Description	Mostoftime	Always
Removeand replacePPEsaccordingtoprotocol	35%	62%

Followrespiratoryhygienepractice	35%	57%
Triage patientsforrespiratorysymptoms	27%	55%
Keepa one-meterdistancebetweenthepatients	36%	58%
Offer medicalmaskforasuspectedCOVID-19patient	23%	67%
Educatepatientandrelatives aboutcoughandsneezeetiquette	30%	65%
Avoidtouchingyoureyes, mouth,ornose	18%	76%
LimitsuspectedconfirmedpatientswithCOVID-19patientsinsideofthefacility	40%	56%
Placesuspected/confirmedpatientswithCOVID-19inanisolationroom	21%	71%
Ensureenvironmentaldisinfectionaftereachpatient	25%	67%
Reporttoasuperior/higherup	27%	68%

Table 8 shows the Knowledge and Behavior scores. The mean knowledge score was 23.5 ±2.9(75.7±9.4%),andthemeanBehaviorscorewas108.6±7.3(87.6±5.9%).ThehighestachievableKnowledgescore possibleis31 andthe Behavior score is 123

Table8:-Knowledgeandbehaviorscoresinstudyparticipants(n=100).

Description		AchievedValue	hest possiblevalue	Percentageachieved
Knowledgescore	Mean±SD	23.5±2.9	31	75.7±9.4
	Range	16 – 31		51.6–100
	Median	23		74.2
Behaviorscore	Mean±SD	108.6± 7.3	124	87.6±5.9
	Range	89–123		71.8–99.2
	Median	110		88.7

Table9showstherelationshipbetweendifferentcategoriesofhealthcareprofessionalsandtheir Knowledge and Behavior regarding COVID-19 Infection Prevention and Control. Therewasnostatisticalsignificancedifferencebetweendifferentwork positionsregardingtheirknowledge and behavior about the COVID-19 pandemic. Based on the knowledge mean scoreand percentage of the total score achieved, it was 23.6 ± 2.2(76.0±7.1%) for doctors, 23.3 ±2.9(75.5±9.5%) for nurses, 24.3 ± 3.5 (78.3±11.3%) for pharmacists, and 23.3 ± 4.1(75.1±13.4%) fortechnician; where (p= 0.882). Similarly, for behavior, it was 108.9 ± 5.7 (87.8±4.6%) for doctors,109.1±9.3(87.6±6.5%)fornurse,106.5±9.1(85.9±7.4%)inpharmacist,and108.8±6.6(87.7±5.3%)fortechnician(p-value=0.938).

Table9:-Relationbetweenworkpositionandknowledgeandbehaviorscores.

Description	Workposition				Kruskal-Wallis	p-value
	Doctor (N=27)	Nurse (N=58)	Pharmacist (N=4)	Technician (N =11)		
Knowledgescore	23.6±2.2	23.3±2.9	24.3±3.5	23.3±4.1	0.66	0.882NS
	76.0±7.1%	75.5±9.5%	78.3±11.3%	75.1±13.4%	0.66	0.362NS
Behavior scoreMean±SD	108.9±5.7	109.1±9.3	106.5±9.1	108.8±6.6	0.41	0.938NS
	87.8±4.6%	87.6±6.5%	85.9±7.4%	87.7±5.3%	0.362	0.948NS

As shown in Table 10, the knowledge and behavior scores compared to each other andexperience and age. There was no statistical significance (p = 0.331) and correlation (r = 0.098)betweenknowledgeandbehaviorscore,nostatisticalsignificance(p=0.283)andcorrelation(r=- 0.1) between knowledge score and years of experience. In addition, between behavior scoresand years of experience, there was no statistical significance (p = 0.925) and correlation (r = -0.01).Atsametime,therewasno statistical significance(p =0.921)andcorrelation(r=-0.01)betweenknowledge score and age, and similarly, there was no statistical significance (p = 0.590) andcorrelation (r =- 0.05)between behaviorscorevs age.

Table10:-Correlationbetweenyearsofexperience, ageandknowledge,andbehaviorscores.

Variables	(r)	p-value
KnowledgescorevsBehaviorscore	0.098	0.331NS
KnowledgescorevsyearsofExperience	-0.1	0.283NS
Behaviorscorevsyears ofExperience	-0.01	0.925NS
Knowledgescorevs.age	-0.01	0.921NS
Behaviorscorevs.age	-0.05	0.590NS

(r): Pearsoncorrelationcoefficient.NS:statisticallyinsignificant

Table 11 presents the relation between the percent of correct knowledge and thedifferent basic data of the study participants. There was no statistical significant relationshipbetween knowledge and gender or work position. On the other hand, there was a statisticalsignificant difference (p = 0.001), between knowledge and contact with COVID-19 cases., Thepercent ofcorrect knowledgewashigherinindividualsincontactwithCOVID-19cases(76.6±9.01%)thanindividualswithoutcontact withCOVID-19cases(65.9±7.4%)

Table 11:- Relationship between knowledge score and gender, work position, and COVID-19contact.

Description	Variables	No	correctknowledge score	CorrectKnowledge%	Test	P-value
Gender	Male	43%	23.9± 2.9	77±9.5	T=1.2	0.232NS
	Female	57%	23.2±2.8	74.7±9.2		
WorkPosition	Doctor	27%	23.6±2.2	75.9±7.1	KW=0.66	0.882NS
	Nurse	58%	23.3±2.9	75.5±9.5		
	Pharmacist	4%	24.3±3.5	78.3±11.3		
	Technician	11%	23.3±4.1	75.1± 13.4		
COVIDcontact	No	9%	20.4±2.3	65.9±7.4	MW =141	0.001S
	Yes	91%	23.8±2.8	76.6±9.01		

T:IndependentsampleTtest. NS: p-value > 0.05 is considered non-significant.KW:Kruskal–Wallistest NS: p-value > 0.05 is considered non-significant.MW:Mann-Whitneytest S:p-value<0.05isconsideredsignificant.

In table 12, the relationship between the percent of good behavior and different basic dataof the study participants. The results showed that there was no statistical significant difference(p=0.091),betweenthepercentofgoodbehaviorandthegenderoftheparticipants(where;male=88.7±5.01andfemale=86.7±6.3).Therewasalsonostatisticalsignificance(p=0.944),betweenpercentofgoodbehaviorsandworkpositionoftheparticipants(where;doctor=87.8±4.6,nurse= 87.6 ± 6.4, pharmacist = 85.9 ± 7.3, and technician = 87.7 ± 5.2). While there is a statisticalsignificance (p = 0.011) in the percent of good behavior in that HCP in contact with COVID-19casescomparedto those notincontact (88.04±5.4% vs82.8± 8.5respectively).

Table12:-Relationshipbetweenbehaviorscore andgender,work position,andCOVID-19contact.

Description	Variables	P	Behaviorscore	Behaviorscore%	Test	P-value
Gender	Male	43%	110.7±8.2	88.7±5.01	T =1.7	0.091 NS
	Female	57%	107.5±7.8	86.7±6.3		
WorkPosition	Doctor	27%	108.9±5.7	87.8±4.6	F =0.12	0.944 NS
	Nurse	58%	109.1±9.3	87.6±6.4		

	Pharmacist	4%	106.5±9.2	85.9±7.3		
	Technician	11%	108.8± 6.6	87.7±5.2		
COVIDcontact	No	9%	102.8±10.6	82.8±8.5	T=2.6	0.011 S
	Yes	91%	109.5± 7.6	88.04±5.4		

T:IndependentsampleTtest. NS: p-value >0.05isconsiderednon-significant.
F:FvalueofANOVAtest. S:p-value<0.05isconsideredsignificant.

Discussion:-

Health care workers, in particular those in contact with COVID-19 patients, are athigher risk of being infected with COVID-19 than the general population. Despite the healthworkers representing less than 3% of the population in the large majority of countries and lessthan2%inalmostalllow-andmiddle-incomecountries,about14%ofCOVID-19casesreportedtoWHOareamonghealthworkers[22].Theproportioncanbeas highas35%insomecountries[23].WHO estimates that in the period between January 2020 to May 2021, between 80000 and180000 health andcareworkers couldhavediedfromCOVID-19[24].

ThefirstconfirmedcaseintheUnitedArabEmirateswasannouncedon29January2020.Itwas thefirstcountryintheMiddleEasttoreport aconfirmedcase[25].AccordingtotheUAENationalEmergencyCrisisandDisasterManagementAuthority'slatestreportaboutcoronavirusdisease(COVID-19)inNovember2021,thetotalnumberofCOVID-19patientswas741433, and the death rate was 21.678 per million [26]. No published statistics regarding theinfection rate among HCW in UAE are available An early survey on HCWs in Al Ain, UAE in2020 indicated that there was a significant gap in knowledge and perception about the COVID-19virus [11].

Available scientific evidence suggests that appropriate personal protective equipment use,handhygienebestpractices,implementationofuniversalmaskingpoliciesinhealthcarefacilities,andadequateinfectionpreventionandcontrol(IPC)trainingandeducationareassociatedwith decreasedrisk of COVID-19amonghealth care workers [22].

Mitigating and reducing the risk of infection in the HCW is essential to protecting their well-being and reducing the spread of COVID-19[22]. Therefore, this study aimed to assess theknowledge and self-reported behavior of healthcare professionals in Hatta Hospital regardingCOVID-19 IPCmaiandtoidentifyanygaps that mightincreasethe riskofinfection.

This is a cross-sectional descriptive study that used a semi-structured self-administratedpaper-based questionnaire involving a convenient sample of healthcare professionals (HCP)working at Hatta Hospital who were willing to participate in the study during the first week ofJune2021.

HattahospitalHCPdependsondifferentsourcesofinformationtobuildup theirknowledgeregardingCOVID-19infectionandpreventioncontrol.Themajority(68%)wasfromsocial media, hospital circular announcements (66%), and scientific journals (55%). There was theuse of multiple sources of information (42%) not relying on social media only most probablyreflectedontheirknowledgescore.Asimilarstudyshowedthatthemostoftenmentionedsourceofinformationabout COVID-19wastheministryofhealthwebsiteorWHOofficialwebsitesandsocialmediawithonlyasmallpercentreportingcourseortrainingastheirsourceofinformation[20]. This was unlikeotherstudieswheresocial mediawasthemainsource [27, 28].

RegardingCOVID-19IPCtraining,ninetypercentofparticipantswereinvolvedinvarioustraining approaches, sixty-five percent acquired most of their training inside Hatta hospital,(44%) reported self-study, and (10%) received

national training, and (4%) learned from anothertraining facility program and all these approaches affected their knowledge and behavior. Thiswas unlike the national survey conducted on the United Kingdom (UK) medical students andinterim foundation doctors during the COVID-19 pandemic, which showed sub-optimal self-reported PPE (43%)and IPC training (56%) in medical students from 33 medical schools in theUKduringthe COVID-19pandemicduringMarch2020[10].

Inthecurrentstudy,theknowledgelevelofHCPaboutCOVID-19IPCwashigh.Themeancorrect answer rate was 75.7 ± 9.4. %. However, the knowledge level of still less than other studiesconducted in Egypt(80.4%), China(90%), and Pakistan(93.2%) [20, 27, 28]. On the other hand, ina study from the United Arab Emirates, poor knowledge about the disease transmission (61%),and the symptom (63.6%) was found in a significant proportion of HCWs [11], this may be duetothecurrentstudy,concentratedonCovid19IPCmeasureswhilethepreviousstudydiscussedcovid 19asadiseasein general.

This study showed that 89% of participants knew about the COVID-19 incubation period(1-14 days). A similar study showed that approximately 96.19% of HCWs indicated that theincubation period of the virus is 1-14 days. This time was very important in preventing diseasespread, and suspected individuals must quarantine for 14 days until symptom appearance orarrivaloflaboratoryreports [29].

Based on the responses of the participants, only 45% knew about the three most commonroutes of COVID-19 transmission. Individually, however, 85% chose droplet transmission, 69%direct contact transmission, and 51% aerosol transmission as routes of transmission. However,51% had a misconception that it was transmissible through the water. In a study from Jeddahcity,SaudiArabia(2020),themajorityofHCWsdisplayedsufficientawarenessofvirustransmission mode, droplets emitted during coughing (97.46%), physical contact with infectedindividuals (96.38%), and sharing clothing/towels (84.07%). However, 54.25% thought of waterasasourceof COVID-19 transmission[29].

Only 54% in the study knew all the three most aerosol-generating procedures, the trachealintubationprocedure,nebulizertreatment,andopenairwaysuctioning.Thisisalargeknowledgegap,asaerosol-generatingprocedureshavebeenassociatedwithanincreasedriskoftransmission of COVID-19 [17]. Moreover, additional airborne precautions are needed whenperforming aerosol-generating procedures other than contact and Droplet precautions [17].However, 56% of participants had misconceptions regarding the collection of sputum as anaerosol-generating procedure.This may explaintheoveruse of respirators during sputumcollection.

The current study showed above-average knowledge about protective measures requiredduring dealing with suspected COVID-19 patients in different situations especially using themedical mask. These results support the previous literature that facemasks are the most essentialpreventivemeasuresinPPEforhealthcareprofessionals[30].Incontrast,Kumaretal.[31]foundHCWs' knowledge regarding the role of facemasks in the prevention of the disease to bemoderate to poor. On the other hand, Olum et al., [32] found about 17% of HCWs believed thatwearinggeneralmedicalmaskswasnotprotective against COVID-19.

One of the findings in the study was the overuse of respirators (N95 or FFP2) that wererecorded and reported from 80 to 87% in different situations. This may be due to fear of beinginfected or transmitting the infection to their families followed by their belief that the disease ishighly transmissible[20].

ThisstudyshowedgoodknowledgeaboutapproachesthathelptopreventtransmissionofCOVID-19 score. Sixty-six percent of study participants knew all four approaches that help toprevent transmission of COVID-19, hand hygiene, staying home, covering nose and mouth whilecoughing,andrapidassessment.All100participants(100%)believedthathandhygienewasthevery essential approach that could help prevent transmission of COVID-19.Hand hygiene isrecognizedglobally as a leading measureof IPC, which is effective in decreasing thetransmissionofcommonrespiratoryviruses,includinghumancoronavirusesandithadbeenusedinrespondingto SARS,and,Ebola[9].

Another area ofknowledgegap which needs improvement,was the correct steps ofdonninganddoffingPPEsasonly59%knewandfollowedthecorrectdonningstepsofPPEs.Inaddition, only 58% knew the correct doffing steps of PPEs. A similar finding showed from anational survey of UK medical students, as the sufficiency of PPE information was significantlyworsethanthatofIPCtraining.Furthermore,thesameUKstudystatedthatitmightbedesirabletoexaminethepro ficiencyofIPCmeasuresandinclude'donninganddoffing'asaskillrequiredfor medicalgraduation[10].

As regards to self-reported behavior of the participants on COVID-19 IPC measures in thecurrent study, the participants have shown a good overall behavior score of 87.6% (SD=5.9).similartoSuleimanetal.studyshowedthat:adherencetosafetymeasureswas80.4%[19].Also,Al-Hanawi etal reportedthatoptimistic attitudesof(94.1%)amongstudyparticipants[33].

Therewas nostatistical significance difference between different work positions, age,gender, work position, and years of experience regarding their knowledge and behavior abouttheCOVID-19pandemic.Olumetal.inUgandareportednosignificantdifferenceinthelevelofknowledge about COVID among HCWs irrespective of their professions or qualifications [32].Inotherstudies,physicianshadasignificantlyhigherlevelofknowledgefollowedbypharmacistsandnurses[34,35] .Similarly,Wahedet al.inEgyptstatedthatthelevelofknowledge about COVID-19 was significantly associated with younger age groups especially20–30 years, and with superior education levels [20]. In this study, there was no statisticalsignificance (p = 0.331) and negative correlation (r = 0.098) between knowledge and behaviorscoresdespitegoodrecordingscoresinbothsections.Thiswasunlikeotherstudiesthatfoundagood knowledge in HCW was significantly associated with this positive attitude [20, 28, 34].Even the studies that included the general population showed that a higher knowledge level wasassociatedwithapositiveattitude[35,36].AccordingtoWahedetal.,[20]knowledgeofHCWsis a very important prerequisite for prevention beliefs, positive attitudes, and promoting positivepractices. It also affects their coping strategies to some level. This may be related to the gapsshown inthecurrentstudy knowledge andhighself-reportedbehavior.

On the other hand, there was a statistical significant difference between knowledge andcontact with COVID-19 patients, the percent of correct knowledge was higher in individuals incontact with COVID-19 cases (76.6 ± 9.01 %) than individuals without COVID-19 contact (65.9 ±7.4%).The Egyptian study similarly found being in direct contact with COVID 19 patientssignificantly increases the knowledge level as direct dealing with patients makes HCWs moremotivatedtoknow aboutthediseaseandto searchforscientificmaterialsandguidelines[20].

ThecurrentstudyreportedthattherewasastatisticalsignificanceinthepercentofbehaviorinthatHCPincontactwithCOVID-19casescomparedtothosenotincontact(88.04±5.4%vs82.8 ± 8.5 respectively). Remarkably, a study on healthcare workers in China showed the self-reported IPC behaviors of HCWs significantly improved after the COVID-19 outbreak. HCWswho were in the affected area and high-risk departments reported better IPC behavior [8]. Thiswas opposite to Lai et al., also from China who reported that the contact with confirmed andsuspected COVID-19 patients did not promote self-reported IPC behaviors, which may resultfrom thehigherworkloadandlack resourcessuchasgowns[9].

Limitation:-

The limitation of this study was that out of 163 participants only 100 (61%) completed thequestionnaire and were included inour study. Thisstudy was from onehospital only and cannotbe generalized to other Dubai health authorities (DHA) hospitals or UAE hospitals. Moreover,IPC'sself-reportedbehaviorsscoreofHCWsmaybeoverestimated,becauseHCWsmayrespondtointerviewquestionsinawaythat theybelieveissociallyacceptableratherthanbeingcompletelyaccurate.

Strength

This study concentrated mainly on COVID-19 IPC measures unlike other studies focusedonthevirusitself.

Conclusions:-

Thisstudyrevealedthat:HattahospitalusedvarietiesofCOVID-19IPCtrainingtechniques and approaches to prevent and control the transmission of the virus among HCP.There was a high level of overall COVID 19 IPC

knowledge and behavior. Nevertheless, manygapsinknowledgeandbehaviorhavebeenidentifiedThisincludesdonninganddoffingofPPEand optimal use of protective measures especially respirators (N95 or FFP2), which can becorrectedto furtherenhancetheprotectionagainst COVID19among theHCP.

Recommendations:-

Basedontheresultsonknowledge andbehaviorofthestudiedparticipantsaboutCOVID-19IPC,some ofthe commendationsthatneed to consider are:
StrengtheningtheCOVID-19IPCknowledgeawarenessthroughvarioustraining,workshop-seminar, and IPC programs to improve the level of healthcare workers especially intermsofPPESdonninganddoffingstepsandtypesofprotectivemeasuresindicatedindifferentpatientapproaches andincludedinannualHCPmandatoryeducation.

Furthermoredirectobservationstudytoevaluateactual IPCbehavior.

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