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An Observational Retrospective Study on Symptoms and Risk Factors Analysis of Covid19 Among Healthcare Workers in a Tertiary Care hospital of Eastern India

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Abstract

Introduction: Coronavirus is a single strand positive sense RNA virus, leading to respiratory, intestinal and other symptoms .The SARS COV2 infection has rapidly grown into a pandemic.**Aims and Objectives :** To evaluate the clinical features and risk factors of COVID 19 among HCWs. **Materials and Methods**: After taking ethical consent and patient consent, the study was conducted in the Medicine department of RKMSP for 5 months with 658 HCWs who were in contact with Covid 19 positive cases. HCWs who developed fever or other symptoms suggestive of COVID 19 infection were tested with RT PCR of SARS COV 2. Positive cases were included in the study and those who came negative were retested after 5 days and were included in the study,with a repeat positive test.The patients were admitted in dedicated COVID wards and observed for 10 days from symptom onset.The symptoms were assessed at regular intervals with monitoring of vitalparametersSpO2, urine output .They were classified as mild, moderate and severe as per ICMR Criteria. Risk factors such as age ,DM, HTN, BMI, bronchial asthma, smoking, COPD etc. were noted.**Results**: 52 symptomatic HCWs tested positive for COVID 19 RT PCR (7.90%)(4 cases were positive on re testing.)Males constituted76.92% of cases.All cases over 60 years of age had severe symptoms and 10 cases who were between 41-60 years had moderate symptoms and rest all were mildly symptomatic.(73.07%) and most of them were between 31-40 years(26.92%).Median age in mild ,moderate and severe cases were33.50 years,55.00 years and 64.50 years respectively .26.92% were doctors,7.69% were nurses,7.69% were technicians and 57.69% were Group D staffs.**Conclusion**:The study showed that despite taking adequate protection, there is an increased risk of infection among HCWs leading to acute shortage of manpower for Health care service.

Keywords: COVID 19, SARS COV2,Health Care Workers,Risk factors, symptoms

Introduction

Novel coronavirus (nCoV) is a new strain of coronavirus, also known as SARS-CoV2 was first identified in Wuhan, China and the disease caused by it is coined as COVID-19. This new virus belongs to the same family of Severe Acute Respiratory Syndrome (SARS)[1]. The virus is transmitted by direct contact with respiratory droplets of an infected person generated through coughing and sneezing and touching surfaces contaminated with the virus.From China the disease spread to the whole world. It entered India on 30.01.2020. WHO declared this outbreak as a public health emergency of International concern on 30th January,2020 and pandemic on 11.03.2020[1].By 17. 09. 2020 ,more than 29.9 million cases have been reported in 188 countries resulting in more than 942000 deaths. As more and more patients started developing moderate to severe symptoms, they required institutional therapy and thus HCPs were also at risk of getting infected due to its highly contagious nature.

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were also chances of transmitting the virus amongst other HCPs and In the process they also became a reservoir of infection and thus there their own family members. During this outbreak, HCPs are expected to work long hours under significant working pressure with often inadequate resources, while accepting the danger of being in close contact with ill patients[2].The risk of death due to COVID-19 is 17 times more amongst doctors and 15 times more amongst all HCW (according to IMA, 11.09. 2020- press release).The positivity rate among HCWs from January to May, 2020 as analyzed by IMA was 4.6%. From February 2020 to April 2020, 53% HCWs were exposed to COVID 19 with a median age of 42 years and 92% had only symptoms of fever, cough and SOB in the UK. Death was reported at 0.398% and all were above the age of 65 years. China's National Health Commission showed that more than 3300 HCW were infected as early as March 2020, by the end of February 2020, 22 HCWs already died[3].The disease spectrum varies from asymptomatic to symptomatic (mild, moderate and severe symptoms with or without SARI. As per ICMR guidelines, mild symptoms include uncomplicated upper respiratory tract infection, with mild symptoms like fever, sore throat, nasal congestion, malaise, headache without incidence of breathlessness or hypoxia, SpO2 >95%; Moderate symptoms include pneumonia without any signs of severe

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disease. Adolescents or adults with presence of clinical features of dyspnea and or hypoxia, fever, cough, including SpO2 less than 94% (range 90-94%) on room air, respiratory rate more than equals 24/ min.; Severe symptoms include severe pneumonia with signs of pneumonia and one of the following- respiratory rate of more than 30/ minute, severe respiratory distress, SpO2 less than 90% on room air or septic shock or acute respiratory distress syndrome (ARDS)) It can infect from two days prior to symptoms onset in symptomatic cases. The incubation period is about 5 days but may range from 2 days to 14 days[4]. In China deaths were recorded in patients aged more than 60 years and three fourth of them had preexisting health comorbidities like DM and HTN[5] Individuals of any age with COPD, obesity, DM and other comorbidities are at increased risk of severe illness with COVID 19 In August 2020, CDC reported that 94% of COVID19 related deaths were due to at least one comorbidity[6]
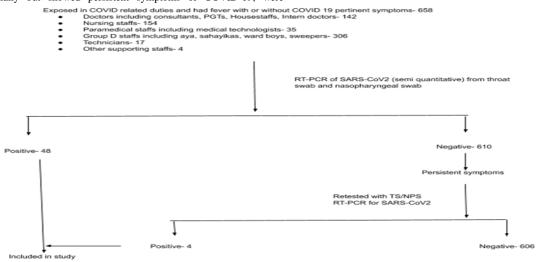
Aims and Objectives
1. To evaluate the symptoms of COVID 19 among HCWs rendering duties to COVID 19 patients in RKMSP.
2. To evaluate the risk factors in SARS-CoV2 positive HCWs.

Materials and Methods
The study was conducted amongst HCWs (including consultant doctors, post graduate trainees, housestaffs, interns, paramedical staffs including technologists, nursing personnels, group D staffs including sweepers, patients caregivers, ward attendants, ayas and other supporting staffs) who were in contact during service to SARS-CoV2 positive patients in between 1st April 2020 to 31st August 2020 in RKMSP.A total 658 health care workers were in contact with all the COVID 19 positive patients and among them, 142 were doctors, 154 were nursing staff, 35 were paramedical staff and technologists, 17 technicians, 306 group D staff, 4 other supporting staff. They were adequately trained about donning and doffing of PPE and disposal of infected materials in appropriate waste disposal buckets. No one was encouraged to reuse PPE. There was also no history of travel or migration from other parts of the country or from foreign countries during the study interval. Those who had fever while rendering services with or without any other COVID-19 pertinent symptoms, like cough, malaise, nasal discharge, anosmia, distaste, were tested with RT-PCR for SARS-CoV2 in throat swab and nasopharyngeal swab (semi quantitative method). Those who tested positive, were included in the study, those who tested negative initially but showed persistent symptoms of COVID-19, were followed up and retested with RT-PCR after 5 days and those testing positive this time, were included in the study. Positive HCWs were admitted in dedicated COVID ward in the hospital and were followed up for the next 10 days from onset of COVID 19 related symptoms like constitutional symptoms (fever, body ache, malaise, lethargy), respiratory symptoms (dry cough, sore throat, anosmia, nasal congestion, shortness of breath etc), gastrointestinal symptoms (ageusia, anorexia, nausea, vomiting, pain abdomen, loose stool) and other manifestations like anxiety, insomnia etc were evaluated daily including appearance of new symptoms during hospital stay. They were monitored regularly with pulse, BP, temperature, respiratory rate, urine output, oxygen saturation by pulse oximetry and thus categorized as mild, moderate and severe symptoms as per ICMR norms. Along with symptoms analysis, risk factors of all HCWs were evaluated which include-age, DM, HTN, BMI, bronchial asthma, smoking COPD etc. Age distribution was done as following range- more than 81 years, 71-80 years, 61-70 years, 51-60 years, 41-50 years, 31-40 years and below 30 years. Mild, moderate and severe cases in each age range were calculated. Likewise BMI (in kg/m^2) was also as follows- 18-24.99(normal), 25 -29.99(overweight), 30-34.99 (obesity class 1). 35-39.99 (obesity class 2), more than 40(obesity class 3).

Result and Analysis
In this study,658HCWs,who were in contact with COVID 19 positive patients while serving them were screened. 52 symptomatic HCWs(7.90%) were tested RT-PCR positive for SARS-CoV2 in TS/NPS (48 initially and rest 4 during retesting). Among them, 40 (76.92%) were male and 12(23.08%) were female. 15 cases were in the age range of 41-50 years, followed by 12 cases each in the age range of 51-60 years and 31-40 years (table 1). Above 60 years there were only 4 cases and 39 cases were in between 31-60 years. All 4 (7.69%) cases who were above 60 years had severe symptoms and 10 (19.23%) cases who were in between 41 to 60 years had moderate symptoms and rest all were mildly symptomatic(73.07%) and most of them (14 cases, 26.92%) were in between 31-40 years (table 2, p value <0.001).<0.001), median age in mild, moderate and severe cases is 33.50 years, 55.00 years and 64.50 years respectively (p value <0.001)[table 4]. Out of 52 cases, 14(26.92%) were doctors, 4(7.69%) were nurses(7.69%), 4 (7.69%)were technicians and rest 30 (57.69%) were group D staffs.

Exposed in COVID related duties and had fever with or without COVID 19 pertinent symptoms- 658
- Doctors including consultants, PGTs, Housestaffs, Intern doctors- 142
- Nursing staffs- 154
- Paramedical staffs including medical technologists- 35
- Group D staffs including aya, sahayikas, ward boys, sweepers- 306
- Technicians- 17
- Other supporting staffs- 4

RT-PCR of SARS-CoV2 (semi quantitative) from throat swab and nasopharyngeal swab

Positive- 48

Negative- 610

Persistent symptoms

Retested with TS/NPS RT-PCR for SARS-CoV2

Included in study   Positive- 4   Negative- 606

Fig 1:Study done

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Table 1: Showing age distribution of HCWs in the study

Age Range (In Years)	Number	Percentage
>80	0	0
71-80	1	1.9
61-70	3	5.7
51-60	12	23.07
41-50	15	28.84
31-40	12	23.07
<30	9	17.3

Table 2: Showing severity of symptoms in different age groups

		Symptoms			Total	p Value	Significance
		Mild	Moderate	Severe			
Age	21-30	9(23.68)	0(0)	0(0)	9(17.31)	<0.001	Significant
	31-40	14(36.84)	0(0)	0(0)	14(26.92)		
	41-50	10(26.32)	2(20)	0(0)	12(23.08)		
	51-60	5(13.16)	8(80)	0(0)	13(25)		
	61-70	0(0)	0(0)	3(75)	3(5.77)		
	71-80	0(0)	0(0)	1(25)	1(1.92)		
Total		38(100)	10(100)	4(100)	52(100)		

While considering symptoms analysis (table 3), constitutional symptoms were present in all cases (52). Fever, bodyache, lethargy and malaise were present in all 52 HCWs. Fever was present for median days of 2.00, 8.50 and 10.00 days amongst mild, moderate and severe cases respectively(significant, p value <0.001). While bodyache, malaise, lethargy were present for median days of 10.00 in all mild,moderate and severe cases.(table 4). Among respiratory symptoms, 45(86.53%) HCWs had some form of symptoms. 45(86.53%) cases had anosmia followed by cough in 40 cases (76.92%) and sore throat in 30 cases (57.69%), while only 14 cases (26.92%) had shortness of breath, who were in moderate and severe categories. Anosmia were present for a median of 7.00, 9.00 and 7.50 days respectively in mild, moderate and severe cases (significant, p value 0.001). Sore throat was present for a median days of 5.00 and 7.50 respectively in moderate and severe cases with 0 median days in mild (significant, p value <0.001). Shortness of breath was present for a median days of8.00 and 10.00 in moderate and severe cases respectively while 0 median days in mild cases (significant, p value <0.001)[table 4]. All cases had some form of gastrointestinal manifestations (52 cases), ageusia was present in all cases(100%), followed by anorexia in 49 (94.23%) and nausea in 46 (88.46%) cases, whereas only 15 cases (28.84%) had loose stool. Ageusia and anorexia were present for a median of 10.00 days in all mild, moderate and severe cases, whereas loose stool was present for a median of 2.00 and 6.00 days in mild and severe cases respectively (significant, p value 0.006) [table 4]. In this study, 48 cases (92.30%) had anxiety and 30 cases (57.69%) had insomnia. No neurological and cardiovascular symptoms were noted.

Table 3: showing numbers and percentage of symptoms amongst HCWs

Symptoms	Percentage
1. Constitutional Symptoms52 (52)	
Fever- 52 (52)	100
Bodyache- 52(52)	100
Lethargy- 52(52)	100
Malaise- 52(52)	100
Headache - 40 (52)	76.92
2. Respiratory Symptoms 45 (52)	
Cough - 40 (52)	76.92
Nasal Congestion - 2(52)	3.84
Sore throat- 30 (52)	57.69
Anosmia- 45 (52)	86.53
Shortness of breath- 14(52)	26.92
3. Gastrointestinal Symptoms 52 (52)	
Ageusia- 52(52)	100
Anorexia- 49 (52)	94.23
Nausea- 46(52)	88.46
Vomiting- 5(52)	9.61
Pain abdomen- 3 (52)	5.76
Loose stool- 15 (52)	28.84
4. Other Manifestations	
Insomnia- 30 (52)	57.69
Anxiety- 48 (52)	92.30

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Table 4: showing median duration of symptoms (in days) and median age (in years) in HCWs

	Symptoms										
	Mild			Moderate			Severe			p Value	Significance
	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation	Mean	Median	Std. Deviation		
Age (years)	37.03	33.50	9.58	53.20	55.00	4.80	66.75	64.50	6.29	<0.001	Significant
Fever Duration	3.24	2.00	2.21	7.90	8.50	1.85	9.75	10.00	0.50	<0.001	Significant
Bodyache duration	9.37	10.00	1.46	9.50	10.00	1.08	10.00	10.00	0.00	0.605	Not Significant
Lethargy duration	9.87	10.00	0.41	10.00	10.00	0.00	10.00	10.00	0.00	0.458	Not Significant
Malaise duration	9.82	10.00	0.51	10.00	10.00	0.00	10.00	10.00	0.00	0.369	Not Significant
Cough duration	7.68	8.00	0.96	8.30	8.00	0.95	9.00	9.50	1.41	0.055	Not Significant
Sore throat duration	1.50	0.00	1.93	5.20	5.00	1.32	7.25	7.50	0.96	<0.001	Significant
Anosmia duration	7.29	7.00	1.04	8.60	9.00	0.52	7.75	7.50	0.96	0.001	Significant
Shortness breath duration	0.00	0.00	0.00	8.10	8.00	0.88	10.00	10.00	0.00	<0.001	Significant
Distaste duration	9.63	10.00	1.17	10.00	10.00	0.00	10.00	10.00	0.00	0.369	Not Significant
Anorexia duration	9.97	10.00	0.16	10.00	10.00	0.00	10.00	10.00	0.00	0.832	Not Significant
Loose stool duration	0.50	2.00	1.01	1.40	0.00	1.84	4.75	6.00	3.20	0.006	Significant

When risk factors were analysed amongst admitted HCWs, 8 cases (15.38%) were hypertensives and 8 cases (15.38%) were diabetics, 25 (48.07%) were smokers, 3 (5.76%) had COPD, 2 (3.84%) had bronchial asthma. While calculating BMI, most (45 cases, 86.53%) cases were overweight and only 1 HCW had class 3 obesity. 10 HCWs (22.22%) who were overweight had moderate symptoms and 4 cases(8.88%) had severe symptoms. In this study, 3 (5.76%) and 4 (7.69%) hypertensive HCWs had severe and moderate symptoms respectively, while rest 1 had mild symptoms (significant,p value <0.001). Amongst diabetic cases, 2 cases (3.84%) had moderate and another 2 cases (3.84%) had severe symptoms while 4 (7.69%) had mild symptoms (table 5). Amongst 3 (5.76%)cases of COPD, 2 had moderate and 1 case had severe symptoms (significant, p value 0.016). No HCW had comorbidities like chronic liver disease, chronic kidney disease, coronary artery disease and malignancy. No HCW had a history of intake of long standing steroid or any immunosuppressive therapy.

Table 5: shows number of comorbidities in mild, moderate and severe cases

	Symptoms						p Value	Significance
	Mild		Moderate		Severe			
	Number	%	Number	%	Number	%		
Hypertension	1	2.63	4	40.00	3	75.00	<0.001	Significant
Diabetes	4	10.53	2	20.00	2	50.00	0.101	Not Significant
Smoking	17	44.74	6	60.00	2	50.00	0.800	Not Significant
COPD	0	0.00	2	20.00	1	25.00	0.016	Significant
Bronchial asthma	2	5.26	0	0.00	0	0.00	0.682	Not Significant

During statistical analysis, continuous variables are expressed as mean, median and standard deviation and compared the groups using Mann-Whitney U test. Categorical variables are expressed as number of cases and percentage of cases and compared across the groups using Fisher's Exact Test. The statistical software SPSS version 20 has been used for the analysis. An alpha level of 5% has been taken, i.e. if any p value is less than 0.05 it has been considered as significant.

Discussion

HCWs are the frontline service providers to the COVID 19 positive patients in this pandemic situation. With the increase in numbers of COVID 19 cases there is increased risk of HCWs getting infected. In our study conducted at RKMSP from 1st April 2020 to 31st August 2020, we screened 658 HCWs including 142 doctors, 154 nursing staffs, 35 medical technologists, 306 group D staffs, 17 technicians and 4 other supportive staffs were in contact withCOVID 19 positive cases while rendering their services. Out of them, 52 (7.90%) were symptomatic and RT-PCR SARS-Cov2 positive. Forty cases were male whereas twelve cases were female. Most of the HCWs (75%) were in the age group of 31-60 years while only 4 cases were above 60 years and all 4 HCWs had severe disease with a median age of 64.5 years. All HCWs had fever and other constitutional symptoms like body ache, lethargy, malaise, headache etc. Median duration of fever in mild, moderate and severe cases were 2 days, 5.5 days and 10 days respectively. So, as the duration of fever increases, the risk of progression to moderate and severe symptomatic disease increases. 86.53% of cases had some form of respiratory symptoms like anosmia, cough, sore throat etc while only 26.92% of cases had

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shortness of breath who were in moderate and severe symptomatic groups. All cases had some form of gastrointestinal symptoms like anorexia, nausea, vomiting, ageusia but only 28.84% of cases had loose stool. 57.69% of cases had insomnia and 92.30% of cases had anxiety symptoms. A study on risk of COVID 19 among frontline health care workers conducted in USA and UK population[7] from 24 th March to 23rd April, 2020 showed that among 134885 HCWs exposed to COVID 19 related duties, 2.747% frontline workers were symptomatic, with median age of 44 years, BMI above 30 kg/m^2 and most of them were smoker.Only one Indian study on prevalence of flu like symptoms and COVID 19 in Healthcare workers from India conducted by Max Healthcare[8],New Delhi, an online-questionnaire based study showed that among 3667 HCWs having flu like symptoms, 14.7% were RT-PCR SARS-CoV2 positive .Human ACE2 receptors are the binding sites of SARS –COV2 which is also the cellular receptor of SARS COV2[9-11].Studies showed that SARS COV 2 used ACE2 for entry into the cells through binding of viral spike(S) protein to cellular ACE2 receptor[12].ACE 2 is present in many organs such as heart, lungs, kidney, intestine and liver[13-16]. Press release by ICMR on 3rd September, 2020 had stated that the overall positivity rate of SARS-CoV2 among indian healthcare workers was 7.2%. A press release by the Health Ministry of India on 3rd September, 2020 revealed that the positivity rate was significantly higher in some states like Maharashtra, Delhi, Telangana, Karnataka, Punjab ranging from 11-18% among HCWs. Though this study was conducted on a small population of HCWs, our study shows a lower number of HCWs getting affected by COVID-19 than other states of India. The probable cause of infection among HCWs are repeated exposure to COVID positive patients, increased workload, repeated donning and doffing, mental exhaustion and inadequate surveillance and monitoring of use of PPE among HCWs. This is the first study in Eastern India among Healthcare workers by far our knowledge regarding the symptoms and risk factors analysis among COVID-19 cases. However multicentric studies are required to analyse and corroborate with the result of the study.

Conclusion

Our study showed that despite taking adequate protection while rendering services to COVID positive cases, there is still a chance of HCWs getting infected, risking their lives. At the same time, with the increase in the number of HCWs getting infected and isolated or admitted in hospitals, there is a decrease in the workforce, compromising with the quality of service.

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