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Covid-19 infection among health care workers of a tertiary cancer hospital

Vinita Trivedi[1*], Richa Chauhan[1], Tulika Keshri[1], Lal Bahadur Singh[2], Reeta Rani[1], Usha Singh[1], Manas Dubey[1]
[1] Department of Radiotherapy Mahavir Cancer Sansthan, Patna, Bihar, India
[2] Department of Medicine, Mahavir Cancer Sansthan, Patna, Bihar, India

Abstract
Background: The Covid-19 pandemic has disrupted routine work worldwide and health care is obviously one of the most worst affected area. Frontline healthcare worker are at high risk of infection as they work in close proximity to the patients who may be infected with the Corona virus contributing to further spread.
Aims: This study was planned to assess the incidence and clinical profile of COVID-19 infection among health care workers in a non COVID tertiary cancer hospital and also to analyze the effect of gender on the clinical spectrum of the disease**.**
Methods and Materials: This is a retrospective analysis of all healthcare workers of Mahavir cancer sansthan and research centre, Patna who tested positive for Covid-19 by RT-PCR method from 1st June 2020 to 31st July 2020. A 10 point questionnaire was prepared for data collection over telephonic and direct interview. Data was analyzed using Chi-square test and paired-t test.
Results: 103 (14%) of the health care workers were infected with COVID-19 till 31st July, 2020 with a male to female ratio of 1:1.7. 46% and 38% of the HCW infected were between 31-40 years followed by cases in the 21-30 years age group respectively. 60% of the patients belonged to the nursing and housekeeping category. 41% of the total patients were asymptomatic at the time of diagnosis and 25% of the diagnosed cases remained asymptomatic throughout. The most common symptom was fever (29%) followed by myalgia (20%), sore throat (18%) and others. More number of female patients Remained asymptomatic than the male counterpart but male patients showed a significantly faster recovery than the female patients.
Conclusion: A high proportion of asymptomatic infection in health care workers stresses the need for proper use of PPE kits, prophylactic drugs along with routine screening for Covid-19 for protection of patients and proper functioning of the hospital.

Keywords: covid-19, cancer, health care workers, asymptomatic

Introduction

Coronavirus disease 2019 was first identified in Wuhan city in Dec 2019, after which the disease has spread to more than 200 other countries [1, 2]. Since its emergence, severe acute respiratory syndrome coronavirus 2, which causes COVID - 19, has become a global threat [3]. Given the rapid spread of COVID-19 and the steep rise in morbidity and mortality it caused, the World Health Organization declared COVID-19 a pandemic on 11th March 2020. As of 15th Sept 2020, total COVID-19 cases worldwide are 29.6M cases with 936K death. INDIA has 5.0Mcases and, 82K COVID-19 related deaths. BIHAR, where this study has been conducted alone has 160K infected cases, with 13.9K active cases and death of 836 patients. The person-to-person transmission routes of Covid-19 include direct transmissions, such as cough, sneeze, droplet inhalation transmission, and contact transmission, such as the contact with oral, nasal, and eye mucous membranes [4]. Due to the high infectivity of the virus, the Government of India responded quickly by invoking the provisions of the Epidemic Diseases Act, 1897. This was followed by a nationwide lockdown in a phased manner from March 22 to May 31, 2020 [5-7]. The imposition of strict restrictions was essential for containing the spread of the virus and building the health-care infrastructure [8]. The rapid spread of COVID-19 led to increased burden over the healthcare system turning many hospitals to COVID dedicated centers. Further nationwide lockdown with restricted transportation facilities made treatment of other disease including cancer very difficult [9]. People suffering from cancer are themselves immune-compromised which is further aggravated by the treatment, making them even more susceptible to contract COVID-19 infection [10-12]. Frontline healthcare worker are at high risk of infection as they work in close proximity to the patients who may be infected with the Corona virus contributing to further spread [13]. Therefore, infection prevention and early diagnosis of potential COVID -19 in health care providers are crucial to maintain a proper functioning of the hospital along with protection of the cancer patients [14]. Because of few studies from India, most of the available data on incidence, clinical characteristic and outcome of COVID-19 infected HCW are from China and European countries. Hence, this study was planned to assess the incidence and clinical profile of COVID-19 infection among health care workers in a non COVID tertiary cancer hospital. We also intend to analyze the effect of gender on the clinical spectrum of the disease.

Materials and Method

The study is a retrospective analysis of all healthcare workers working at Mahavir cancer sansthan and research centre, Patna. The participants included all the health care workers who had tested positive for COVID-19 from 1st June 2020 to 31st July 2020. A confirmed case of COVID-19 was defined as a positive result by reverse transcriptase polymerase chain reaction (RT-PCR) assay of nasal and pharyngeal swab specimens. A 10 point questionnaire was

prepared for data collection over telephonic and direct interview. Each participant was informed about the study purpose, and verbal consent was obtained before proceeding for the interviews. The participants who did not consent to be a part of the study were excluded from the analyses. **Interview process**: Participants were either directly or telephonically contacted to introduce themselves, verify identities, describe the study purpose and check availability for interviews. Following verbal consent, direct/telephonic interviews, which took 5-10 min, were conducted. At the close of the interviews, participants' queries related to COVID-19 were addressed. For our primary endpoint, the data regarding the overall incidence and incidence among various categories of staff was calculated. The patient's gender, associated co morbidities, use of prophylaxis, recent travel history and clinical spectrum of disease were also analyzed. Further subset analysis was done to compare the clinical profile of male and female patients. Given the retrospective nature of the study, approval from the Institutional Ethics Committee was not required as a part of our institutional protocol, and the need for obtaining written informed consent was also waived. **Statistical Analysis**: Sample size calculation was not done, as the study included all consecutive HCW who tested positive for Covid-19 infection during the study period. Data were entered in Microsoft Excel for further analyses. Continuous and categorical variables were summarized by descriptive statistics. The Chi-square test and paired-t test was used to compare the variables between the two groups. A two-sided $P \leq 0.05$ was considered statistically significant.

Results

A total of 103 health care workers out of 734 (14%) staff working at Mahavir Cancer Sansthan, Patna tested positive for COVID-19 during the study period. However, 11 participants were either unavailable for interview or did not give consent. Hence, they were excluded from the study and the study cohort included 92 HCWs. A gender wise analysis showed that 34(37%) were male and the rest 58(63%) were female. The most common age group affected was from 31-40yrs. with 42(46%) cases followed by 35(38%), 12(13%), and 3(3%) in the 21-30, 41-50, and 51-60yrs. age-group respectively. Among different category of staffs, the most severely affected were the nursing and housekeeping staff who together contributed to 32% and 27% cases respectively. Doctors made up 12% and other HCWs constituted 15% of the total COVID-19 positive cases. Majority of the HCWs (82%) had no co morbidity. Diabetes was the most common co-morbidity reported in 9% of cases followed by hypertension and hypothyroidism in the remaining 9% of HCWs. Among the positive cases, only 5% had taken hydroxyl chloroquine as prophylaxis.38 (41%) of the total patients were asymptomatic at the time of diagnosis; out of which a significant number of 15 patients (16%) developed symptoms after diagnosis (p-value- 0.02). Twenty three (25%) of the diagnosed cases remained asymptomatic throughout the course of the disease. [Table.1] Remaining 67(73%) of the patients had a varied clinical presentation with fever (29%) and myalgia (20%) being most common symptom at the time of diagnosis. This was followed by symptoms like sore throat (18%), nasal congestion (8%), cough (8%), weakness (8%), mild breathlessness on exertion (3%) etc. However, the pattern of clinical presentation changed after the diagnosis with more patients complaining of myalgia (25%), sore throat (18%), weakness (15%), cough (15%) nasal congestion (14%), and breathlessness on exertion (9%). [Table.2 & Figure 1] Almost all the patients recovered on home isolation and oral treatment as recommended by ICMR without requiring hospital admission and oxygen support. Only 1 HCW required ICU admission because of sudden breathlessness but recovered and was discharged in 2 days. There was no COVID-19 related death in any of the HCWs. A subset analysis of male and female showed the median age for male patients was 34yrs and that for female was 32 yrs.7(20.5%)of the male and 9(15.5%)of the female HCW had associated co morbidity. Only 2(6%) female and 3(5%) male had taken chloroquine prophylaxis. 41% of both male and female population were asymptomatic at the time of diagnosis. Out of which 9(26%) male and 20(34.5%) female remained asymptomatic during the whole course of disease. However, this difference was not significant (p-value = 0.423) However, the male patients had a faster recovery than the female counterparts as 18(53%) of male patients recovered in 1st week as compared to only 17 (29%) of the female patients (p-value= 0.024). Another significant difference seen was that 7 (12%) of the female patients had persistent symptoms even after 3 weeks of diagnosis compared to none among the male patients (p-value = 0.034) [Table.3 & Figure 2]

Discussion

Our study showed that showed 14%of the health care workers had been infected with COVID-19 till 31st July, 2020. More female staffs were infected with a male to female ratio of 1:1.7. Majority of the HCW infected were between 31-40 years followed by cases in the 21-30 years age group, which was around 46% and 38% respectively. Only 3% of patients were more than 50 years of age. About 60% of the patients belonged to the nursing and housekeeping category. Covid-19 positive doctors contributed to 12% of the cases. 95% of the cases had not taken any prophylactic drugs. 38(41%) of the total patients were asymptomatic at the time of diagnosis and 23(25%) of the diagnosed cases remained asymptomatic throughout the course of the disease. The most common clinical presentation at the time of diagnosis was fever (29%) followed by myalgia (20%), sore throat (18%), nasal congestion (8%), cough (8%), weakness (8%), mild breathlessness on exertion (3%). While, fever subsided after diagnosis other symptoms like myalgia, weakness and cough increased after the diagnosis in the patients. Though statistically insignificant, more number of female patients remained asymptomatic during the whole course of disease than the male counterpart. However, the male patients showed a significantly faster recovery than the female patients in our study. Although Covid-19 is a pandemic, the risk of getting infected varies across different occupations. Health care workers along with other essential workers have an increased exposure to the SARS-CoV-2 virus as they need to continue their daily duties even during the imposed lockdown period [15]. This often brings them in close proximity to asymptomatic carriers or infected patients and hence increases the risk of getting infected. In addition, their risk may be increased due to working closely with infected asymptomatic or even sick colleagues (presenteeism) who still report to work [16]. A prospective study by Mutambutzi et al on occupation and risk of Covid-19 reported a seven-

fold higher risk for healthcare workers [17]. Regarding gender predilection of Covid-19 infection, data collected from many countries around the world suggest that men and women are equally likely to acquire COVID-19 [18]. However, our study showed a higher number of female patients which could be explained by the fact that most of the nurses and housekeeping staffs, the worst affected category, are females. Further, the housekeeping staffs usually belong to low socio-economic strata with a poor nutritional status and also unaware of the proper use of personal protective equipments provided. The relatively younger age distribution seen in our study is in contrast to the data which reported that a majority of the corona virus (COVID-19) cases in India affected people between ages 45 and 74 years as of July 9, 2020 [19]. Being a single institutional study, the difference in age distribution could have resulted because of more numbers of young health care workers employed, and the younger staff forming the first line of contact with the patients thereby shielding their senior counterparts. The ability of hydroxychloroquine to inhibit the infection by SARS-CoV-2, as well as viral replication in cell cultures in a time- and dose-dependent manner made it a primary choice in the absence of any known antiviral and vaccine [20]. Furthermore, HCQ elevates the pH of endosomes and inhibits SARSCoV-2 RNA-mediated inflammatory response. As a result, ICMR had given recommendations for the use of hydroxychloroquine as a prophylaxis against Covid-19 [21]. Among the positive cases seen in our study, 95% had not taken Chloroquine as prophylaxis. This study was started during the initial stage of disease outbreak in the region. A cross-sectional study by Saluja et al also reported that most of the cases were asymptomatic or had very mild clinical presentation similar to our study [22]. The initial reports from Wuhan also reported that 81% of patients manifest as self-limited respiratory symptoms typical of a viral pneumonia, including fever, cough, dyspnea, sore throat but also, interestingly, anosmia and dysgeusia [23]. Severe disease, accounting for 14% of the cases in the same cohort, includes florid pneumonia which may progress to acute respiratory distress syndrome (ARDS) along with cardiogenic or distributive shock [23]. A meta-analysis of 2019 novel corona virus patient also reported that fever and cough (both dry and productive), fatigue, shortness of breath and muscle aches were the major symptoms in patients who were diagnosed to be suffering from COVID-19 [24]. Centre for disease control (CDC) has also listed above symptoms to be the major symptoms [25]. Mild symptoms and recovery of all the Covid-19 infected patients in our study could be contributed to young age of the patients and low incidence of associated co-morbidities. Many published reports and systematic review have shown that older age, diabetes, hypertension, Cardiac diseases, and an immunosuppressed state are among the most common co-morbidities that results in increased infection, virulence and fatality when an individual is affected by the Corona virus [26-27]. Many reports from China and other countries have reported a relatively higher mortality in the male patients infected by Corona virus studies but there is a limited data or rather paucity of data on time to recovery according to patient age or sex [28-29]. Our study showed a higher percentage of female Covid-19 positive cases remained asymptomatic than the male counterpart. However, the female patients who developed symptoms took longer time to recover than the male patients. An analysis of 5769 Israeli patients by Voinsky et al showed similar recovery among male and female patients but a faster recovery for the younger age-group [30]. The strength of this study is that it includes data from a large charitable cancer hospital with around 800 staff. Caring for the immunocompromised cancer patients who are more prone to develop infection with Covid-19 disease leads to a high risk of exposure to Corona virus among the healthcare workers. However our study has its own limitations which include a retrospective design and telephonic interview used for data collection. Telephonic interviews can result in inaccurate data subjected to recall bias. Further, being a single institutional study the data cannot be generalized for the population.

Table 1: Showing baseline characteristics of Health care workers infected with Covid-19

Parameters	Number	Percentage
Gender		
Male	34	37%
Female	58	63%
Age		
21-30	35	38%
31-40	42	46%
41-50	12	13%
51-60	3	3%
Occupation		
Doctors	11	12%
Nursing staff	29	32%
Technicians	12	13%
Housekeeping staff	25	27%
Security guard	1	1%
Others	14	15%
Co-morbidities		
Absent	75	82%
Diabetes	8	9%
Hypertension	4	4.5%
Hypothyroidism	4	4.5%
Clinical Presentation		
Asymptomatic	25	27%
With symptoms	67	73%

Prophylaxis		
Yes	5	5%
No	87	95%
Duration of symptoms(weeks)		
1	35	38%
1-3	25	27%
3-5	7	8%

Table 2: Showing clinical presentation at diagnosis and after diagnosis in Covid-19 positive health care workers

Clinical Presentation	At Diagnosis	After Diagnosis	Absolute difference	p-value
Asymptomatic	38(41%)	23(25%)	16%	**0.02**
Nasal congestion	7(8%)	13(14%)	6%	0.19
Sore throat	17(18%)	17(18%)	0%	1.00
Fever	27(29%)	20(22%)	7%	0.27
Cough	7(8%)	14(15%)	7%	0.13
Breathlessness	3(3%)	8(9%)	6%	0.08
Weakness	7(8%)	14(15%)	7%	0.13
Myalgia	18(20%)	23(25%)	5%	0.41
Others*	5(5%)	9(10%)	5%	0.19

*anosmia, altered taste sensation, diarrhea, vomiting, abdominal pain, chest pain.

Table 3: Showing comparative profile of Male and Female Covid-19 positive health care workers

Parameter	Male (Total-34)	Female (Total-58)	Absolute difference	p-value
Median age (yrs)	34	32		
Comorbidities				
Yes	7(20.5%)	9(15.5%)	5%	0.535
No	27(79.5%)	49(84.5%)	5%	
Prophylaxis				
Yes	2(6%)	3(5%)	1%	0.884
No	32(94%)	55(95%)	1%	
Asymptomatic at diagnosis	14(41%)	24(41%)	0%	0.984
Remained asymptomatic	9(26%)	20(34.5%)	8.5%	0.423
Duration of symptom(weeks)				
1	18(53%)	17(29%)	24%	0.024
1-3	10(29%)	15(26%)	3%	0.711
>3	0	7(12%)	12%	0.034

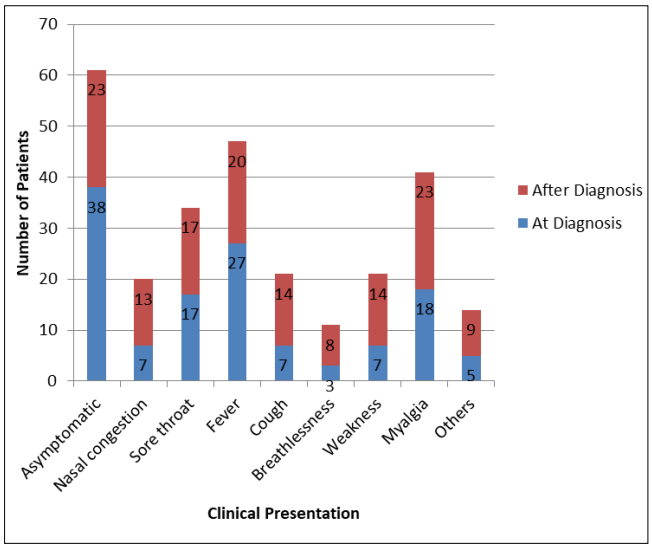

Fig 1: Bar graphs showing clinical presentation at diagnosis and after diagnosis in Covid-19 positive health care workers

Conclusion

Our study is probably among the few studies assessing the incidence and clinical profile of health care workers working in an exclusive tertiary cancer centre. Though 14% of the health care workers were infected, most of them were asymptomatic or had mild symptoms. So, proper use of PPE kits, prophylactic drugs along with routine screening for Covid-19 should be used for all health care workers especially those caring for patients with disease like cancer.

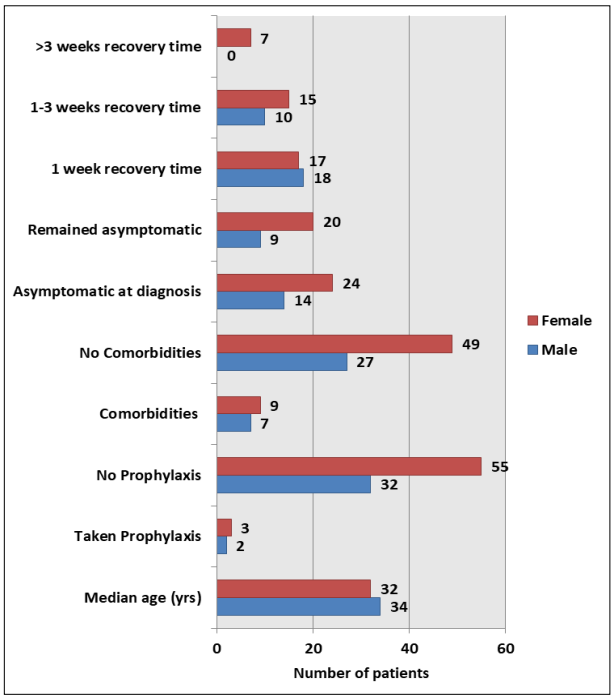

Fig 2: Bar graphs showing comparative profile of Male and Female Covid-19 positive health care workers

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