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Study of COVID-19 epidemic in India and Andhra Pradesh with comparative global figures

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ABSTRACT

Background: We have studied the pattern of COVID-19 epidemic in Andhra Pradesh and compared with other high burden states in India utilizing Government of India statistics. We have compared the Indian figures with the statistics in other countries.

Materials and Methods: We have analyzed the data published by Ministry of Health and family Welfare Government of India, Government of Andhra Pradesh and WHO statistics as well as worldometer statistics. We have studied the hospital statistics of our tertiary care COVID center and analyzed the results.

Results: The statistics revealed highest number of cases are seen in United States of America with case fatality rate of 1.74%.Mexico has highest case fatality rate of 8.5%. Italy has 3.5% and United Kingdom 2.8%.In India Maharashtra has highest number of COVID-19 casualties with case fatality of 2.52%. Indian national average of case fatality is 1.47%. Andhra Pradesh has a case fatality of 0.80%. In Andhra Pradesh the pandemic of COVID-19 peaked in the months of August and September both in terms of number of cases and deaths and then decline started. Hospital based records showed a death rate of 3.92%.

1. Introduction

Corona virus or COVID -19 virus disease rattled the entire world and still is spreading rapidly in Europe and America. First reported in Wuhan city in China and spread to the entire world causing considerable human morbidity and mortality.[1] The novel Corona virus disease has resulted in sudden increase in cases of viral Pneumonia worldwide with multi organ failure. The virus spreads from asymptomatic and symptomatic individuals with an incubation period of five days. The disease is diagnosed by reverse transcriptase polymerase chain reaction that has a sensitivity of around 67%.[2]

Drugs like Hydroxychloroquine, Ivermectin, Tocilizumab, Remdesivir have been used with insufficient evidence.[3] Glucocorticoids with their anti-inflammatory effect have been found to be very useful and reduced mortality.[4] As per autopsy reports done on patients dying of COVID-19 disease patients with and without comorbidities suffered from extrapulmonary lesions like hepatic, renal, bone marrow involvement with microvascular injury and thrombosis. Lung and cardiovascular involvement are predominant.[5] Autopsy, electron microscopy and molecular biology of the specimen have resulted in better understanding of the pathology of covid disease.[6] There is diffuse alveolar damage, with extensive inflammation with microvascular thrombin, hyaline membranes, endothelial inflammation, hemorrhage and angiogenesis. Vascular lesions are more significant.[7] COVID-19 related Acute Respiratory Distress Syndrome occurred in 8-12 days after the onset and High Flow Nasal Oxygen proved effective in mild to moderate disease.[8] Over production of inflammatory cytokines like IL-6, and Tumor Necrotic Factor alpha lead to systemic inflammation and acute myocardial infarction. Because of the affinity of corona virus to ACE 2 receptors and its effect on rennin angiotensin

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aldosterone system it can produce myocarditis and can lead to left ventricular dysfunction, myocardial inflammation and pericardial involvement and finally haemodynamic instability.[9] Worldometer statistics reveals that there are a total of 105 million cases in the world and 2.3 million deaths.

The COVID-19 epidemic is seen in 221 countries in the world and World Health Organization declared it as a pandemic. COVID-19 disease is mild to moderate in 80% of cases. Severe disease occurs in 15% and critical illness in 5%. Case fatality rate of 0.5–2.8% with much higher rates (3.7–14.8%) in old age.[10] The virus is transmitted by air and by direct and indirect contact and most frequent way of spread is by droplets.It can cause mild flu like symptoms to overwhelming pneumonia and can cause death.[11]

Several countries including India adopted the principle of containment of disease, contact tracing and isolation of disease clusters. 85% of cases occurred due to human to human transmission and cases occurred because of unprotected exposure. Transmission took place during early part of infection.[12] The COVID-19 disease spread to all the countries in the worldwithin three months of its onset from Wuhan in China and was declared a pandemic by WHO on 11^{th} March 2020. Because of its contagiousness and morbidity and mortality the pandemic has a deep impact on the economy of several developing countries.[13]

Health care workers in China were aware of the infectiousness of disease and more than 85% of them took adequate precautions. Proper training of health care workers regarding protective precautions and adequate rest in between is found to be absolutely essential.[14] Compared to general population health care workers have higher prevalence of COVID-19 positivity.[15] The pandemic entered India by the end of January 2020 and spread rapidly and has its impact socially, economically and culturally.[16] Complete lock down and isolation of cases were implemented in India from March 2020

2. Materials and Methods

It is an observational study of COVID-19 epidemic in our tertiary care covid hospital. We also studied the statistics of Andhra Pradesh and other Indian states as per the publication of Ministry of health and Family welfare and WHO publications and worldometer corona statistics.

2.1. Place of study

NRI Medical College Hospital, Chinnakakani, Guntur District, Andhra Pradesh

2.2. Duration of study

March 2020 to January 2021

2.3. Study design

Prospective Observational study

3. Results

Table 1: Month wise cases in Andhra Pradesh

Month	No.of Positives	No. of deaths
Until March	40	0
April	1363	31
May	1639	31
June	11533	125
July	126338	1162
August	293838	2620
September	252580	1811
October	135997	910
November	39716	302
December	14222	116
January 2021	5550	45

Table 2: District wise cases in Andhra Pradesh

District	No.of Positives	No.of deaths	Percentage
Anantapur	67644	599	0.88%
Chittoor	87035	847	0.97%
East Godavari	124260	636	0.51%
Guntur	75504	670	0.89%
YSR Kadapa	55264	463	0.84%
Krishna	48661	676	1.39%
Kurnool	60816	488	0.80%
Nellore	62325	506	0.81%
Prakasam	62175	580	0.93%
Srikakulam	46125	347	0.75%
Visakhapatnam	59763	561	0.94%
Vizianagaram	41133	238	0.58%
West Godavari	94236	542	0.57%

Table 3: COVID-19 disease and mortality in Different high burden states of India in comparison to Andhra Pradesh

State	No. of COVID cases	Deaths	Case fatality rate
Kerala	929179	3744	0.40%
Maharashtra	20,26,399	51082	2.52%
Karnataka	939387	12217	1.30%
Tamilnadu	838340	12356	1.47%
Delhi	635096	10853	1.71%
West Bengal	569998	10173	1.78%
Uttar Pradesh	600299	8658	1.44%
Andhra pradesh	887836	7153	0.80%
Telangana	294469	1599	0.54%
India	10815222	154956	1.47%

Table 4: Hospital based statistics in a COVID tertiary care centre in Andhra Pradesh

Total No. of Patients Admitted	Total No. of Deaths	Mortality Percentage
10691	419	3.92%

Table 5: Month wise admissions and deaths in NRI MC

Month	No. of Patients	Deaths	Percentage
April 2020	277	0	0
May 2020	161	0	0
June 2020	515	0	0
July 2020	2889	66	2.28%
August 2020	2595	138	5.32%
September 2020	2277	93	4.08%
October 2020	1541	51	3.31%
November 2020	744	34	4.57%
December 2020	303	28	9.24%
January 2021	124	7	5.64%
February 2021	4	2	2
Total	10682	419	3.92%

Table 6: International Statistics

Country	No. of COVID-19 Cases Reported	No. of Deaths	Mortality Percentage
World	106685660	2327308	2.18%
USA	27.6 Millions	474933	1.74%
Mexico	1.9 Million	165786	8.72%
Brazil	9,524,640	231561	3.55%
UK	3,945680	112465	2.85%
Russia	3,967281	76661	1.93%
India	10,838, 843	155114	1.47%
South Africa	1476135	46290	3.13%
Italy	2636738	91273	3.46%

4. Discussion

COVID-19 pandemic in Andhra Pradeshhas declined to a considerable extent because of containment, isolation and treatment facilities provided by the Government of Andhra Pradesh. Overall mortality is less than 1% and is less than the national average. Godavari districts of Andhra Pradesh showed maximum number of patients because of dense population and low mortality is probably because of better awareness among population and better treatment options. Chittoor and Guntur districts showed fairly large number of cases possibly because of pilgrim and commercial activity respectively.

Study of different states revealed highest number of cases in Maharashtra with a case fatality rate of 2.52%. Andhra Pradesh has less than 1% case fatality rate. Kerala showed the least case fatality rate of 0.40%

Statistical analysis of COVID-19 in Andhra Pradesh revealed that positive cases were reported from the month of March 2020. The number of cases reached its peak in the month of August 2020 and the decline started. Less than one hundred cases are reported per day at the end of January 2021.

Deaths from COVID-19 disease started from April 2020. Reached its peak in August 2020 and the gradual decline started. East Godavari, West Godavari, Guntur and Chittoor districts reported large number of cases. East Godavari district topped with more than 1,24,000 cases during the pandemic. Surprisingly the death rate in Eastand West Godavari districts is around 0.5%. Overall death rate in the general population in Andhra Pradesh is less than 1%

India is a mosaic country with different states showed different case burden and different case fatality rates. Maharashtra has highest number of cases with case fatality rate of 2.52%. Andhra Pradesh, Telangana and Kerala have a case fatality rate of less than 1%. Highest number of cases in Maharashtra can probably be attributed to large urban slums in cities like Mumbai.

Internationally highest disease burden was seen in United States but case fatality is high in Mexico. European countries have considerably high case fatality rates.

Hospital based study revealed highest number of COVID-19 cases were recorded in the month of July 2020 and highest number of deaths took place in the month of August 2020 in our tertiary care center. Overall mortality among COVID-19 patients in the hospital is 3.92%

Lockdown and isolation measures adopted in India helped to contain the rapid spread of disease. During this period awareness of the disease among the Indian public increased. Death rate among the general population in different districts of Andhra Pradesh on the whole has been less than one percent. COVID-19 hospital statistics revealed nearly 3.92% mortality. This is because many patients had treatment outside before they joined the hospital. Increased use of corticosteroid and anticoagulants decreased mortality among admitted COVID-19 patients.

5. Summary

We have analyzed the data published by Ministry of Health and family Welfare Government of India, Government of Andhra Pradesh and WHO statistics as well as worldometer statistics. We have studied the hospital statistics of our tertiary care COVID center and analyzed the results.

The statistics revealed highest number of cases are seen in United States of America with case fatality rate of 1.74%.Mexico has highest case fatality rate of 8.5%. Italy has 3.5% and United Kingdom 2.8%.

In India Maharashtra has highest number of COVID-19 casualties with case fatality of 2.52%. Indian national average of case fatality is 1.47%. Andhra Pradesh has a

case fatality of 0.80%. In Andhra Pradesh the pandemic of COVID-19 peaked in the months of August and September both in terms of number of cases and deaths.

Hospital based records showed a death rate of 3.92%.

6. Conclusions

COVID-19 pandemic differed in different countries and different Indian states. The reason probably is the difference in virulence of the organism as well as innate resistance in different populations. Measures of isolation of cases and lockdown measures observed in India decreased the mortality rate. Use of anticoagulants and corticosteroids also contributed to decreased fatality in India

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9. Conflict of Interest

The authors declare that they have no conflict of interest.

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