

Original Research Article

A study of demographic and economic profile of COVID-19 mortalities in tertiary health care hospital setting

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ABSTRACT

Background: The health care system could not cope up with upsurge of cases being reported. This enormous magnitude of patient load derailed functionality of hospitals and has put in public health challenges to prevent subsequent pandemics and ensure all time readiness of health care system. This study focused to understand the interactive phenomenon among demographic and economic profile of COVID-19 mortalities in a hospital setting of a tertiary health care facility.

Methods: A cross sectional study was undertaken using retrospective data analysis and qualitative study through group discussions among clinical subject specialist of various streams to assess and arrive at a reasoned cause analysis targeted towards prospective technical gains for institutional, individual and facility-based strengthening.

Results: The age group 31-70 years had highest COVID-19 deaths (80%) with 51-70 years representing very high deaths (46.9%). Least mortalities were noted among those with occupation of agriculture (7.1%). Zone wise distribution shows that the joint family of east zone showed highest percentage of COVID-19 mortalities among females (22.2%) whereas it was lower among males (10.1%) however in the same zone and in the type of family.

Conclusions: The study concludes of felt need for elaborate preparedness of programmatic, managerial and implementer-based facility support to enable health care facility for minimizing and preferably zeroing mortalities due to ongoing or future pandemics. It shall surely provide the quantum and directionality to the needed efforts by all stakeholders at various levels of interventions for sustainable gains directed towards universal health care.

Keywords: COVID-19 mortalities, Demographic, Economic, Hospital

INTRODUCTION

COVID-19 has emerged as a pandemic in year 2020 and challenges against this virus continued to exist as many mutant variants of corona virus are circulating in different areas of world. Many factors are linked with development of severity of SARS-CoV-2 cases. Sociodemographic, clinical, genetic, psychological and other factors are playing critical role in occurrence, transmission, morbidities and mortalities of SARS-CoV-2 cases.¹⁻³ The

present study was undertaken to find out sociodemographic factors related to death of persons infected with SARS-CoV-2. Previous studies have shown that sociodemographic and psychological factors are also important in morbidity and mortality related to Coronavirus disease 2019. A wide spectrum of clinical outcome ranging from asymptomatic to highly fatal pneumonia in COVID-19 has been observed and this range cannot be explained by single exclusive factor. A complex interaction of multiple factors inclusive of

sociodemographic, clinical, genetic, psychological and other factors may be responsible for outcome. Hence, this study was conducted and analysed in a tertiary care hospital to assess various factors that are linked to affect severity of Coronavirus disease 2019.^{4,5}

The objectives of the study included to find out demographic and economic profile of COVID-19 mortalities in the hospital setting and to assess association between COVID-19 mortalities and residence zone

METHODS

A cross sectional study was undertaken to assess various parameters related to COVID-19 deaths in a tertiary care hospital during April-May 2021. Secondary data from hospital records was taken and qualitative discussion among various medical field experts was held. Study variables included age, gender, occupation, qualification, income, type of family, number of children in a family and their residence. Inclusion criteria comprised of subjects who died from COVID-19 disease in tertiary care hospital in between April-May 2021. Exclusion criteria comprised of subjects who were admitted and died from disease other than COVID-19 in tertiary care hospital between April-May 2021. Focused group discussion was also held with experts.

In this retrospective study, secondary data from hospital record were taken and qualitative assessment was done in which focused group discussion among experts of different medical streams (Medicine, pulmonary medicine, anaesthesia, otorhinolaryngologist, psychiatrist) and administrative authorities i.e., nursing and medical superintendent were done. The focus of this study was to study whether sociodemographic and psychological factors have significant impact on Coronavirus disease 2019.

In this study age, gender, zone wise residence, income, occupation, education, type of family and dependent children in family factors were taken into consideration. Qualitative data was also collected by organizing multiple focused group discussion with medical field experts. Data analysis was done in MS excel sheet for statistical analysis.

RESULTS

The highest COVID-19 mortalities have been found in age group 51-70 years (46.9%), followed by 31-50 years (33.1%) and more than 70 years (16.5%) (Table 1). The COVID-19 mortalities were seen highest among unemployed (27.6%) and those working in private sector (25.9%) with cumulative total been more than half of the total COVID-19 mortalities (53.5%). The least mortalities were noted among those having occupation either as agriculture (7.1%) and retired persons (9.9%). Majority of COVID-19 mortalities have been among male gender (65.1%) as compare to female gender (34.8%) (Table 2).

Table 1: Age and gender wise distribution of COVID-19 mortalities.

Age group (Years)	Male		Female		Total (%)
	N	%	N	%	
18-30	05	4.2	01	1.5	6 (3.3)
31-50	32	27.1	28	44.4	60 (33.1)
51-70	56	47.4	29	46.0	85 (46.9)
>70	25	21.1	05	7.9	30 (16.5)
Total	118	65.1	63	34.8	181

Table 2: COVID-19 mortalities vs occupation.

Occupation	Male		Female		Total (%)
	N	%	N	%	
Agriculture	12	10.1	01	1.5	13 (7.1)
Business	31	26.2	01	1.5	32 (17.6)
Private service	39	33	08	12.6	47 (25.9)
Gov. service	17	14.4	04	6.3	21 (11.6)
Retired	16	13.5	02	3.1	18 (9.9)
Unemployed	03	2.5	47	74.6	50 (27.6)
Total	118	65.1	63	34.8	181

The mortalities among those having education level been graduate and above (43.6%) has been followed by those who have been educated between middle and higher secondary level (33.1%). Almost all zones except west zone have represented equal distribution for COVID-19 mortalities, although there is observed gender wise differences in various zones (Table 3). The west zone has reported least COVID-19 mortalities (18.2%) as compare to north zone (23.2%), south zone (24.3%) and east zone (34.2%). The highest mortalities among male were noted in east zone (30.5%) as compared to north zone 21.7%, south zone 26.2%, and west zone 16.1%, there by having total representation of male being higher than females (65.1% vs 34.8%) (Table 4).

Table 3: Education level and COVID-19 mortalities.

Education	Male		Female		Total (%)
	N	%	N	%	
Illiterate	05	4.2	8	12.6	13 (7.1)
Up to middle	16	13.5	13	20.6	29 (16.0)
Up to higher secondary	41	34.7	19	30.15	60 (33.1)
Graduate and above	56	47.4	23	36.5	79 (43.6)
Total	118	65.1	63	34.8	181

Table 4: Zone wise COVID-19 mortalities.

District zone	Male		Female		Total (%)
	N	%	N	%	
North zone	32	27.1	10	15.8	42 (23.2)
South zone	31	26.2	13	20.6	44 (24.3)
East zone	36	30.5	26	41.2	62 (34.2)
West zone	19	16.1	14	22.2	33 (18.2)
Total	118	65.1	63	34.8	181

Table 5: Zone vs mean Income wise distribution of COVID-19 mortalities.

District zone	Male, (n ₁ =118)			Female, (n ₂ =63)			Total, (n=181)
	N	%	Mean annual income (INR in lacs)	N	%	Mean annual income (INR in lacs)	Mean annual income (INR in lacs)
North zone	32	27.1	5.09	10	15.8	1.86	4.32
South zone	31	26.2	3.09	13	20.6	2.62	2.96
East zone	36	30.5	3.34	26	41.2	2.10	2.82
West zone	19	16.1	4.10	14	22.2	2.44	3.40

Table 6: Type of family and zone of COVID-19 mortalities.

District zone	Male (n ₁ =118)						Female (n ₂ =63)					
	Type of family											
	Nuclear		Joint		Three generation		Nuclear		Joint		Three generation	
	N	%	N	%	N	%	N	%	N	%	N	%
North zone	15	12.7	11	9.3	06	5.0	4	6.3	5	7.9	1	1.5
South zone	15	12.7	12	10.1	4	3.4	6	9.5	7	11.1	0	0
East zone	19	16.1	12	10.1	5	4.2	12	19.0	14	22.2	0	0
West zone	11	9.3	04	3.4	4	3.4	10	15.8	03	4.76	01	1.5

It has been observed that the mean annual income in the north zone among male (5.09 lac Rupees) is more than double that of female (1.86 lac Rupees) with mean annual income of COVID-19 mortalities person of north zone (4.32 lac Rupees) being highest among all zones (3.40 lac rupees in west zone, 2.96 lac Rupees in south zone and 2.82 lac Rupees in east zone). Mean annual income in the south zone among male (3.09 lac Rupees) is higher than female (2.62 lac rupees) with mean annual income of COVID-19 mortalities person of south zone being 2.96 lac Rupees. Mean annual income in the east zone among male (3.34 lac Rupees) is higher than female (2.10 lac Rupees) with mean annual income of COVID-19 mortalities person of east zone being 2.82 lac rupees. Mean annual income in the west zone among male (4.10 lac Rupees) is higher than female (2.44 lac Rupees) with mean annual income of COVID-19 mortalities person of west zone being 3.40 lac rupees (Table 5).

The distribution of COVID-19 mortalities among male population in various zones as represented by highest zonal percentage for nuclear family (16.1%) has been highest in east zone as compared to joint families (10.1%) each in south and east zone and three generation family (5%) in north zone. Similarly, the distribution of COVID-19 mortalities among female population in various zones as represented by highest zonal percentage for nuclear family being (19.0%) has been highest in east zone as compared to joint families (11.1%) in south zone and three generation family (1.5%) in north zone.

In addition, it has been found that the zonal percentage representation in north zone for nuclear family among male (12.7%) is higher than the same among female (6.3%). Similarly, it is higher among male (9.3%) than female (7.9%) in the joint family of north zone. There are more than 3 times COVID-19 mortalities among male (5.0%) of three generation family in the north zone as

compared to female (1.5%). In addition, it has been found that the zonal percentage representation in south zone for nuclear family among male (12.7%) is higher than the same among female (9.5%). However, it is higher among female (11.1%) than Male (10.1%) in the joint family of south zone. There is no reported death of female in three generation family of south zone among female as compared to mortalities among male (3.4%) in south zone (Table 5). It has been found that the zonal percentage representation in east zone for nuclear family among female (19.0%) is higher than the same among male (16.1%). It is higher among female (22.2%) than male (10.1%) in the joint family of east zone. There is no reported death of female in three generation family of east zone among female as compared to mortalities among male (4.2%) in east zone. In addition, it has been found that the zonal percentage representation in west zone for nuclear family among female (15.8%) is higher than the same among male (9.3%). However, it is higher among female (4.76%) than male (3.4%) in the joint family of west zone. There is lesser mortality among female (1.5%) in three generation family of west zone as compared to mortalities among male (4.2%) in west zone (Table 6).

DISCUSSION

Mortality noted among age group 51 to 70 years in present study is supported by the group discussion held during qualitative research conducted herein has suggested that the COVID-19 positive patients reported in tertiary health care centre had already entered either in terminal stages or their condition was fast deteriorating probably due to uncontrolled cytokine storm. Since the cytokine storm is observed at the end of the first week of morbidity, the admitted patients suddenly succumbed to it due to the inflammation of the vessels and thrombosis or other complications at a later date ranging from one week to three weeks.

Although stress level among patients was not assessed as per any pre identified stress indicator level-based criteria and the opinions obtained are individual perceptions, but it has been observed by the intensivist that those having panicked due to the unknown case scenario and related likely consequences have been observed to have higher incidences of deaths. The present study has observed the comparative distribution of zone wise mortalities, which may be considered as indicators of interventions for prevention and control of future pandemics and another wave of current pandemic, if any.

The nuclear, joint and three generation families have differing mortalities among groups in this study. However, further research into this trend is required for reasoned and comprehensive answer. High hospital admission was probably due to the Covid infection being endemic in affected population as the COVID-19 positive test results were being reported in large number. Although the use of steroids was mentioned clearly in the guidelines being circulated, it was however observed that the greater and stricter adherence to steroid use may have been exercised especially among the stage of treatment and care prior to hospitalization. It has also been noticed that during 2nd wave of the pandemic, the opinion of various subject expert deferred on timing dose and duration in accordance with their clinical experience.

The tertiary care centre located in the urban area may although be represented by lesser beneficiary load of those involved in agriculture as evidenced by observed finding of 7.1% mortalities having mention of occupation being agriculture. The observance of cases of black fungus was different at different time, facilities and geographical zones and therefore the sole important reason for its occurrence could only be suspected to overuse of steroids and lower immunity apart from iatrogenic infection.

The study noted gender wise, zone wise and type of family wise differences observed among various groups of COVID-19 mortalities, but the reasons for low mortality among lower socioeconomic strata and rural population or areas still needs to be deciphered. Although no specific reason has been identified for relatively lesser number of infected person and less severity of disease among those from low socioeconomic group, it may however be due to the higher rate of exposure to various infective agents in the earlier life and hence in being possession of greater immunity profile.

The mortalities in the initial phase have also been due to ongoing uncertainties, frequently changing treatment guidelines and unforeseen public health challenges faced in related patient care facilities by all stakeholders including health managers, public health specialists and health care service providers.

Socio-demographic factor analysis for occurrence of COVID-19 is more significant for directionality and

intensity of disease transmission and for greater and in depth understanding of its relationship with morbidity and mortality profile.⁶ However, the influence of population density and the area are not very specific markers of disease transmission process and progress. The preponderance of factors related to spread of COVID-19 have been short listed as sociodemographic, environmental and clinical factors. Studies have also been done for age and gender stratified morbidity, recovery and mortality status of varied nature including co-morbid conditions. The rate of infection has also been study against population densities among various communities over various geographical zones.¹

The mathematical analysis based comparisons have also been made for percentage of variance and cumulative percentage for the study data set.² While understanding details of frailty phenotype and frailty index, it has been understood that the magnitude, severity and effects of COVID-19 is very high for those with any of the frailty phenotype viz current age, gender, deprivation status, ethnicity, smoking status, alcohol intake, and multi morbidity against the criteria of frailty index including robust, pre-frail and frail level of frailty index.³

The visible, noticed and almost universally distributed framework of gender gap, as evidenced through male preponderance across the continent, has underlined the yet unexplained reasons for the role played by estrogen receptor in averting or controlling the virus infections here COVID-19. Transmission of zoonotic infection of COVID-19, which has been initially seen as viral pneumonia, is reported to have origin from animal sources which bat to human transmission, snakes to human.⁴

The likelihood of black, Asian and minority ethnic (BAME) groups has been reported very high for morbidity and mortalities with COVID-19 irrespective of any gender, and hence it has been generally inferred that the differences among varied population cluster or not related to the genetic or biological causes, but can be attributed to social networks, epidemiologically different settings and structural variance in the population resulting in the vast differences of the health outcome specially in the ongoing COVID pandemic times. These inequalities have been listed as due mostly to the socioeconomic causes including deficiencies and deprived scenario of diet, nutrition, education, healthy environment, health care facilities and overcrowding.

Although it has not been established, however there are different opinion about the effect of smoking, drinking and drug abuse on the susceptibility of individuals for COVID-19 infections. In some observation it has been found that the health, food availability and transport has also been the reason for BAME group being more susceptible than the white groups of United states of America.⁵ Gender has been identified as a sure risk factor for increased morbidity and mortality irrespective of age,

and individuals' inherent immune status. Multiple severity analysis and mortality analysis have although been done, but uniformly available large data set are lacking for a convincing and conclusive interpretation.

It is not well understood but observed fact that mortality among women has been 50% of that among men with most affected age group being 19-50-year age. In some developing countries the death was very high among COVID-19 infected individual with co-morbidities than those without co- morbidities. Those having lesser access to hospital facility, living in poverty and not using preventing step were among the more vulnerable population. Demographic density being is found to be directly proportional to the occurrence of COVID-19 cases.^{7,8}

A study conducted in Mosul-Iraq stressed upon conducting special campaigns for COVID appropriate behaviour especially among socio-economically deprived people, elderly population and unemployed people.⁹ A US based study has inferred that the epidemics or pandemics need to be controlled by bending the curve of social disparity through appropriate policy based and society centric activities for risk reduction measures. The persistent social inequities have been found associated to the observance of pandemic, its severity and timing. It has also hence found to be having great impact on the economic imbalances on the deprived and vulnerable communities. Social vulnerability has been assessed globally by using heat maps of reported incidents, reported hospitalization and reported deaths. Hence the risk associated with geographical distribution is also studied to assess the association of social inequities with severity of case burden during a pandemic.

This research is important since it has focused on comparison of smaller areas represented Geo-zones to enable early, easy and intervention friendly identification of distribution of infection, severity and its progression over horizons of time. The extensive analysis of interaction among social, demographic and clinical factors inform that specific public health interventions are needed for long term, medium term and short-term basis for addressing the general and specific health issue of vulnerable population towards prevention and treatment and care as well as aborting possible consequences of terminally ill health resulting in mortalities.¹⁰

Regional differences however have been seen in various public health zones with higher observance on north and east region of Tehran province, Iran. It has also been noticed that establishing causal relationship during the pandemic with various existing habits, behaviour, occupation, social networks, environmental factors, and health care facilities may not truly depict core reasoning of the causal network and phenomenon happening at cellular and macro level. Hence, in comprehensive research-based conclusions especially through compiled data set of various studies by meta-analysis and systemic

reviews will guide the medical fraternity for learning, experience and application of the thus gained knowledge based to deal with the future pandemic based on evidenced public health practices.¹¹

Limitations

The analysis is based on the time limited, facility limited and area limited analysis of the data and opinions and hence need to be further supported by subsequent large-scale studies.

CONCLUSION

The marked difference in gender wise distribution and occupation represented COVID-19 mortalities draw attention of public health for greater in depth understanding of relationship between demographic and economic profile of COVID-19 mortalities in a given hospital setting for a possible identification of underlying factors to avert the mortalities in future from COVID-19 or any other pandemic. The geographical distribution of COVID-19 mortalities among different types of families also guides us to prioritize the attention of public health specialist, program managers, program implementers, program evaluators and program designer to have a relook into the important aspects of demographic and economic profile of such mortalities with futuristic policy development and program planning at various level of governance, administration and management of communicable diseases.

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