

Original Research Article

COVID-19 patients with hypothyroidism: a retrospective cohort study from a dedicated COVID hospital of Mumbai, India

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ABSTRACT

Background: India was one of the leaders in terms of COVID-19 cases across year 2020. Hypothyroidism is one of the common morbidities that may influence prognosis of infectious diseases. However, some previously published literature had suggested that hypothyroidism may not be affecting outcomes of COVID-19 disease. Objective of this study was to analyze the outcomes of COVID-19 patients with pre-existing hypothyroidism and further suggesting determinants of worse outcomes

Methods: This retrospective cohort study was carried out at one of largest Dedicated COVID-19 Hospital in Mumbai, India. Of the 16306 patients that got admitted at this hospital in year 2020, all those having hypothyroidism were included. Bivariate analysis was performed using Chi-square test and Multivariate analysis was performed using multiple logistic regression.

Results: A total of 251 patients were having pre-existing hypothyroidism (1.54%). More females had hypothyroidism (73.7%) while death rate was more in males (26.3%). ICU admissions (27.5%) and death proportions (18.3%) were significantly more in hypothyroidism. Diabetes and hypertension were common concomitant Co-morbidities and odds ratios for death for diabetes group, hypertension group and diabetes+hypertension group were 4.9, 8.1 and 4.4 respectively in comparison to those having exclusive hypothyroidism.

Conclusions: This study deals with an important topic of co-existing Hypothyroidism in COVID-19 patients and we can conclude that patients with Hypothyroidism must be considered to be at risk of severe outcomes. Furthermore, age, male gender and presence of concomitant Co-morbidities increase the risk of worse outcome.

Keywords: Hypothyroidism, COVID19, COVID-19 outcome

INTRODUCTION

The World Health Organization (WHO) declared COVID-19 disease as a pandemic on 11th March 2020.¹ India has been amongst the leaders of the globe in numbers of COVID19 cases almost throughout the year 2020.²

Since the early days of pandemic, epidemiological studies had shown that COVID-19 disproportionately affects patients with pre-existing co-morbidities like Diabetes,

Hypertension, etc.³ Hypothyroidism is one of the apparently neglected Co-morbidities which may be sometimes overshadowed by likes of Diabetes or Hypertension, etc. A retrospective Cohort study concluded that Hypothyroidism was not associated with worse outcomes in COVID-19 patients.⁴ British Thyroid Foundation had issued a statement wherein they have summarized that COVID-19 disease presentations will not be significantly different in those having thyroid diseases.⁵ An update published regarding COVID-19 and

thyroid has discussed about effect of virus on the thyroid gland and functioning.⁶

However, hypothyroidism remains one of the important and commonly seen co-morbidity that can be seen with any infection including COVID-19. A Meta-analysis published in July 2020 concluded that people with thyroid disorders had more than two times chance of having severe COVID-19 disease (OR 2.4).⁷

Also not many published articles on this topic with Indian study settings could be found during the phase of literature review. Hence, this study was carried out at one of the largest dedicated COVID hospitals to review the effects of COVID-19 on patients suffering from hypothyroidism.

The study process included analyzing the outcomes of COVID-19 patients with pre-existing hypothyroidism and further suggesting determinants of worse outcomes.

METHODS

This retrospective cohort study was carried out in one of the largest Dedicated COVID-19 Hospital (DCH) of Mumbai city. A total of 16306 COVID-19 patients were admitted to this hospital throughout the year 2020. After obtaining ethical clearance and required administrative

permissions, all patients who got admitted with pre-existing hypothyroidism were selected for this study.

Universal sampling was followed. Severity of clinical state was measured by requirement of intensive care (ICU admission) and Outcome of Death. The cohort of Hypothyroidism patients was compared to the whole population of 16306 COVID-19 patients to assess impact of Hypothyroidism disease.

The study data was entered into Microsoft Office Excel Spreadsheet and analyzed using OpenEpi and SPSS software. Median and Range were used to summarize quantitative variable (Duration of hospital stay). Bivariate analysis on categorical variables was carried out using Chi-square test and multivariate analysis was performed using Multiple Logistic Regression.

RESULTS

A total of 251 COVID-19 patients were suffering from Hypothyroidism out of a total of 16306 COVID-19 patients admitted in year 2020 (March to December 2020) at this Dedicated COVID Hospital. Hence the proportion of Hypothyroidism amongst COVID-19 patients at this centre was 1.54%. Age and sex distribution of hypothyroid patients in comparison to all patients is summarized in Table 1.

Table 1: Age and sex distribution of hypothyroid patients in comparison to all COVID-19 patients at study site.

Variable	Group	Hypothyroid (%) (n=251)	All patients (%) (n=16306)	P value
Age (in years)	Upto 50	85 (33.9)	7779 (47.7)	p<0.001
	More than 50	166 (66.1)	8527 (52.3)	
Sex	Female	185 (73.7)	5946 (36.5)	p < 0.001
	Male	66 (26.3)	10360 (63.5)	

Clearly, most of the Hypothyroid COVID-19 patients were older than all COVID-19 patients admitted at this hospital. It is a known fact that Hypothyroidism is common in females and the same can be seen here (73.7% opposed to 36.5%).

Percentage requirement for ICU care and Death rates were clearly in excess in hypothyroid patients (Figure 1). 13.1% of all patients needed ICU during their treatment which rises to 27.5% for Hypothyroidism. Overall death rate was 8.8% which rises to a thumping 18.3% in those suffering from Hypothyroidism. Both these differences were statistically significant.

Table 2 shows bivariate analysis (using Chi Square test) and Multi variate analysis (using Multiple Logistic Regression) using death outcome and for variables like Age, sex, duration of hospital stay, presence of comorbidities and need for intensive care.

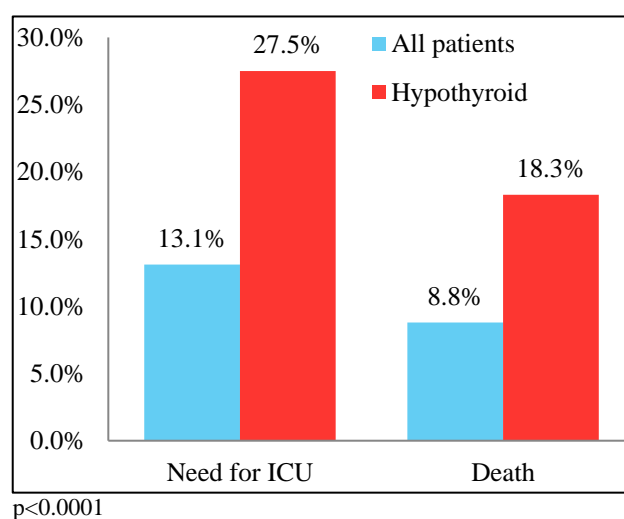


Figure 1: Comparison of need for Intensive care and Outcomes of Hypothyroid patients with all COVID-19 patients at study site.

Table 2: Bivariate and multivariate analysis of determinants of death in hypothyroid patients.

Variable	Groups	Total (%)	Deaths (%)	Bivariate analysis	Multivariate analysis
		(n=251)	(n=total of group)		(OR and p)
Age	Upto 50 years	85 (33.9)	5 (5.8)	p<0.001*	1
	More than 50 years	166 (66.1)	41 (24.7)		1.61 (p=0.43)
Sex	Female	185 (73.7)	28 (15.1)	p=0.03*	1
	Male	66 (26.3)	18 (27.2)		1.5 (p=0.39)
Need for ICU	No	182 (72.5)	10 (5.5)	p<0.001*	1
	Yes	69 (27.5)	36 (52.1)		46.1 (p < 0.001)*
Hospital Stay	< Median	128 (50.9)	25 (19.5)	p=0.3	1
	> Median	123 (49.1)	21 (17.1)		0.14 (p=0.01)*
Co-morbidities	Only Hypothyroidism	107 (42.6)	6 (5.6)	p<0.001*	1
	Hypothyroid and Diabetes [!]	29 (11.6)	7 (24.1)		4.9 (p=0.04)*
	Hypothyroid and Hypertension [^]	60 (23.9)	16 (26.7)		8.1 (p=0.01)*
	Hypothyroid and Diabetes and Hypertension [#]	48 (19.1)	15 (31.3)		4.4 (p=0.03)*
	Hypothyroid and Others ^{\$}	7 (2.8)	2 (28.5)		2.1 (p=0.5)

! hypothyroid+diabetes +/- others but not hypertension, ^Hypothyroid+hypertension +/- others but not diabetes, #Hypothyroid + diabetes + hypertension +/- others, \$Others includes other comorbidities like ischaemic heart disease, stroke, epilepsy, kidney disease, etc without diabetes and hypertension, * Statistically significant p – value.

Only 5.8% young (Age<50 years) hypothyroidism patients died as compared to 24.7% in elder age group. The proportion of female hypothyroid patients was more, but the death rate was significantly higher in their male counterparts (27% as compared to 15.1%).

The median duration of hospital stay was 11 days (range 1-106 days). 19.5% of those having shorter hospital stay (less than Median) had death as outcome. 69 out of 251 hypothyroid patients required Intensive care during their hospital stay and death rate (52.1%) amongst these was significantly worse in comparison to those who did not require intensive care (OR=46.1, p < 0.001).

Death rates were compared among various comorbidities group. The diabetes group had a death rate of 24.1%, Hypertension group had 26.7% while diabetes+hypertension group had a death rate of 31.3%. The odds ratios for these three groups were 4.9, 8.1 and 4.4 respectively in comparison to those having exclusive Hypothyroidism and all these findings were statistically significant.

Table 2 shows that the death rate among 107 patients having only Hypothyroidism was just 5.6%. However, on comparing these 107 patients with those patients admitted with no Co-morbidity (10982) at time of admission

(Figure 2) it was found that proportion of mortality was almost four times more in exclusive hypothyroidism group. In other words, presence of only hypothyroidism without any other Co-morbidity, led to an increase in mortality (5.6% against 1.8%) and also concurrent increase in need for intensive care (17.8% as opposed to 6.1%) was observed.

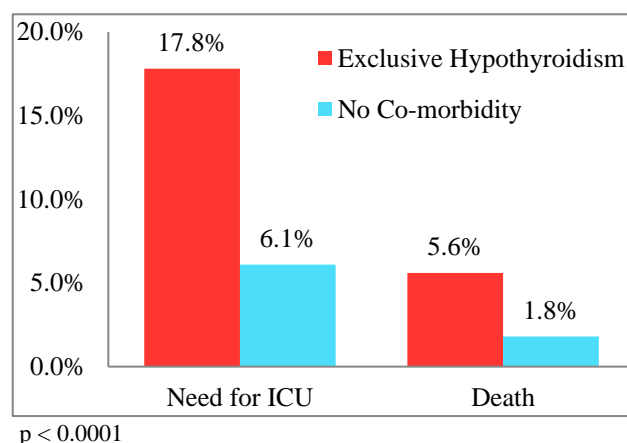


Figure 2: Comparison of ICU admissions and deaths amongst those having exclusive hypothyroidism (no other comorbidities) and those having no comorbidities.

DISCUSSION

The proportion of pre-existing Hypothyroidism found in this study was 1.54%. This is much lower than overall prevalence of self-reported Hypothyroidism which was found to be 6.75% for Mumbai and 7.48% for India.⁸ Almost two-thirds of COVID-19 patients with Hypothyroidism were above 50 years of age and were significantly elder as compared to overall COVID-19 population admitted at this hospital. Also there was a visible female preponderance among the hypothyroidism patients. These findings corroborate with those of a similar previous studies.^{4,9,10}

The requirement of intensive care and proportions of death were significantly more in patients having Hypothyroidism as compared to all patients. Previously published studies didn't find such an association or they were not statistically significant.^{4,10} A study from Kuwait reported significantly higher ICU admissions (12%) among hypothyroid COVID-19 patients; however, the same proportion was more than double (27.5%) as per the current study.¹²

Diabetes and Hypertension were the most common concurrently appearing comorbidities. The odds of death were 4.9 times in presence of diabetes, 4.4 in presence of both hypertension and diabetes and 8.1 times in presence of Hypertension; thereby signifying that these two Co-morbidities were significant predictors of worse outcomes. Also, a standout finding was that presence of Hypertension lead to more deaths. These findings also corroborate with previously published literatures.¹²

To summarize, though many previous literatures have ruled out hypothyroidism as a significant risk factor for severe presentations and death in COVID-19 patients, this study in one of the largest Dedicated COVID-19 Hospital of Mumbai and India was able to show that hypothyroidism clearly influenced the disease severity and outcomes of COVID-19 patients.^{4,5}

Most remarkable finding that we got in this study was that proportion of ICU admissions and death in absence of any Co-morbidity were 6.1% and 1.8% respectively which went higher upto 17.8% ICU admissions and 5.6% mortality among the exclusive Hypothyroidism group.

These findings may also be influenced by the fact that many patients with pre-existing Hypothyroidism may not be receiving the optimal replacement of levothyroxine and this load of uncontrolled hypothyroidism amongst those receiving levothyroxine treatments may be as high as 54%.¹³

Previously published literature has also focussed on impact of COVID-19 on thyroid gland and there exists a potential of exacerbation of pre-existing thyroid disease due to the COVID-19 disease itself which in turn may influence the outcome.^{14,15}

Limitations

The biochemical correlations weren't studied hence stratification on basis of current thyroid status (Hypo, Euthyroid or Hyper) could not be done and also reverse impact of COVID-19 on hypothyroidism was not included in this study.

CONCLUSION

This study deals with an important topic of co-existing Hypothyroidism in COVID-19 patients and we can conclude that patients with Hypothyroidism must be considered to be at risk of severe disease presentations and worse outcomes. Furthermore, age, male gender and presence of concomitant Co-morbidities increases the risk and such sub-groups would apparently be in need of advanced clinical care during their stint with COVID-19 disease.

Recommendations

Therefore, we recommend that all patients with pre-existing Hypothyroidism be labelled as at risk individuals in Dedicated COVID-19 hospitals and they must receive appropriate and optimal advanced clinical care as per their COVID-19 disease presentations.

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