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### RESEARCH ARTICLE

#### ROLE OF PNEUMONIA SEVERITY INDEX AND CURB-65 SCORE IN PATIENTS WITH ACUTE EXACERBATION OF COPD WITH REFERENCE TO THEIR DURATION OF HOSPITAL STAY

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CURB65, COPD, Exacerbation, Mortality, Hospital Stay

#### Abstract

**Aim and Objective:** To investigate the role of Pneumonia Severity Index and CURB-65 score in patients with acute exacerbation of COPD with reference to Duration of hospital stay.

**Methods:** In our study a total of 100 patients of COPD with acute exacerbation were included in the study from the tertiary care Centre, Kolkata for a period of 12 months from December 2015 to November 2016.

**Results:** The relationship between Respiratory rate, Arterial pH, Urea and BUN levels, Blood glucose, Hematocrit level, pO<sub>2</sub> as well as PSI and CURB-65 score in reference with duration of hospital was found to be significant. Our study revealed that PSI and CURB-65 score have good predictive capacity for in hospital deaths as well as duration of hospital stay.

**Conclusion:** PSI and CURB -65 can predict the duration of hospital stay, with a good prognostic capacity. The role of PSI and CURB-65 in defining duration of hospital stay needs to be assessed by further studies on larger samples using Indian data for reference value. The present study is a stimulus to future research on role of PSI, CURB-65 as well as comorbidities in defining the outcome of acute exacerbations in COPD, one of the most dreaded respiratory diseases.

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#### Introduction:-

Chronic obstructive pulmonary disease (COPD) is a global public health epidemic, and a major cause of worldwide chronic morbidity and death. At the moment COPD is the fourth leading cause of death in the world but is predicted to be the third leading cause of death by 2020. More than 3 million people died from COPD in 2012, representing 6 percent of all deaths worldwide.<sup>1</sup>

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Overall, COPD's burden is projected to grow in the coming decades because of continued exposure to COPD risk factors and population ageing.<sup>2</sup>

Chronic obstructive pulmonary disease (COPD) is a common, preventable and treatable condition characterized by repeated breathing symptoms and airflow obstruction due to airway and/or alveolar irregularities usually caused by prolonged exposure to noxious particles or gases. A mixture of small airway disease (e.g., obstructive bronchiolitis) and parenchymal damage (emphysema), the relative contributions to which differ from person to person, induces the persistent airflow restriction that is characteristic to COPD.

The most frequently known risk factor for COPD worldwide is tobacco smoking. Other types of tobacco (e.g. pipe, cigar, water pipe) as well as marijuana are also risk factors for COPD. Other major risk factors for COPD are natural, industrial and indoor air pollution, the latter resulting from biomass fuel burning. Likewise, non-smokers can develop COPD.

COPD is the product of a dynamic interplay of long-term accumulated exposure to noxious gases and particulate matter, coupled with a number of host factors like biology, airway hyper-responsiveness and impaired lung development during childhood.<sup>3-5</sup> The prevalence of COPD is not directly related to the prevalence of cigarette smoking, although in many countries it affects the air quality.<sup>6,7</sup>

Acute COPD exacerbation is a rapid worsening of the symptoms of COPD (shortness of breath, increased frequency and severity of coughing, color and phlegm quantity). There is evidence that at least 75-80% of acute COPD exacerbations are originally infectious and 20-25% of the rest are due to allergens (pollen, wood particles, house dust), pulmonary embolism, heart failure, occupational hazards (coal miners, cotton fiber workers, hard rock miners, tunnel workers, concrete manufacturers), toxins including a variety of different chemical agents. In very few COPD exacerbation cases the cause cannot be identified.

Pneumonia is an infectious lung parenchyma. It is also misdiagnosed, maltreated and neglected despite being the source of major morbidity and mortality. The most common type of pneumonia is Group Acquired Pneumonia (CAP); other forms are Hospital Acquired Pneumonia (HAP), Ventilator Associated Pneumonia (VAP) and new pneumonia Related Health Care (HCAP) groups.<sup>8</sup>

The Pneumonia severity index (PSI) is a clinical prediction rule that medical professionals may use to assess the risk of morbidity and mortality in community-acquired pneumonia patients. The law uses ages (whether someone is older and male or female), comorbid disease coexistence, physical examination findings and vital signs, and important laboratory findings. The PSI attempts to assess the seriousness of the patient's pneumonia to determine the amount of treatment services to be allocated.<sup>9</sup>

CURB-65<sup>10,11</sup> also referred to as the CURB criterion, is a clinical prediction rule validated for predicting mortality in community-acquired pneumonia and any site infection. The CURB-65 is based on the previous CURB ranking, and is recommended for pneumonia severity evaluation by the British Thoracic Society.

It is important to see a physician for an accurate diagnosis, for both COPD and pneumonia. COPD puts a person at a higher risk of developing pneumonia. The longer both conditions are left untreated, the worse the prognosis, and the shorter the life expectancy of a person may become. However, pneumonia is considerably more severe when COPD is present, with a greater risk of life-threatening respiratory failure. Hence, studying the outcome of COPD and pneumonia coexistence is important.

Chronic obstructive pulmonary disease (COPD) is a common co-morbidity in patients with community-acquired pneumonia (CAP) that can be explained mainly by the altered local and systemic immunity associated with this condition.<sup>12,13</sup> Although this respiratory disease is a clear risk factor for CAP, it has not been shown to be a mortality risk factor.<sup>14</sup> Accordingly, COPD was not included in the Pneumonia Severity Index (PSI) as one of the five major comorbidities assessing the risk of death.<sup>15</sup> A number of clinical and epidemiological trials were performed to assess the effect of COPD on CAP patients' mortality, with contradictory findings. Although two studies do not support COPD as a risk factor for death<sup>14,16</sup> two additional studies showed excess CAP mortality in COPD patients.<sup>15,17</sup>

Another study in patients with extreme CAP treated in an intensive care unit (ICU) showed also an increased risk of

mortality.<sup>18</sup> One of the main problems of these studies is the lack of COPD spirometric confirmation in some patients.<sup>15,18</sup>

The aim of this prospective study was to determine whether COPD is a risk factor for pulmonary complications and death in patients hospitalized on CAP. To that end, we selected COPD patients with a spirometrically validated diagnosis.

## Material And Methods:-

### Site of study:

Kolkata a multi-specialty tertiary care hospital.

### Study population:

In this study 100 patients of COPD coming to the emergency department with signs and symptoms of acute exacerbation were included.

### Study design:

Prospective, Observational and Hospital based study of 100 patients.

### Sample size:

$N$  (sample size) =  $z_{\alpha}^2 p(1-p)/e^2$  where  $p$  is proportion,  $e$  is precision  
Here  $\alpha = 5\%$  hence  $z_{\alpha} = 1.96$ ,  $p = 7\%$ ,  $e = 5\%$ ,  $n$  is coming as 100.

### Duration of Study:

The study was conducted for a period of 1 year (December 2015 – November 2016).

### Eligibility criteria:

#### Inclusion criteria:

All diagnosed cases of COPD presenting to the Emergency Department of tertiary care Centre Kolkata with acute exacerbation with signs and symptoms suggestive of pneumonia were the subjects of present study.

#### Exclusion criteria:

Acute exacerbation of copd patients with history of hospital admission in the last 14 days. History of antibiotic ingestion in the last one month. Patient who does not want to be a part of the report.

## Methodology:-

Demographics, clinical signs and symptoms, co-morbidities and laboratory and radiographic findings of patients coming with Acute Exacerbation of COPD (chronic obstructive pulmonary disorder).

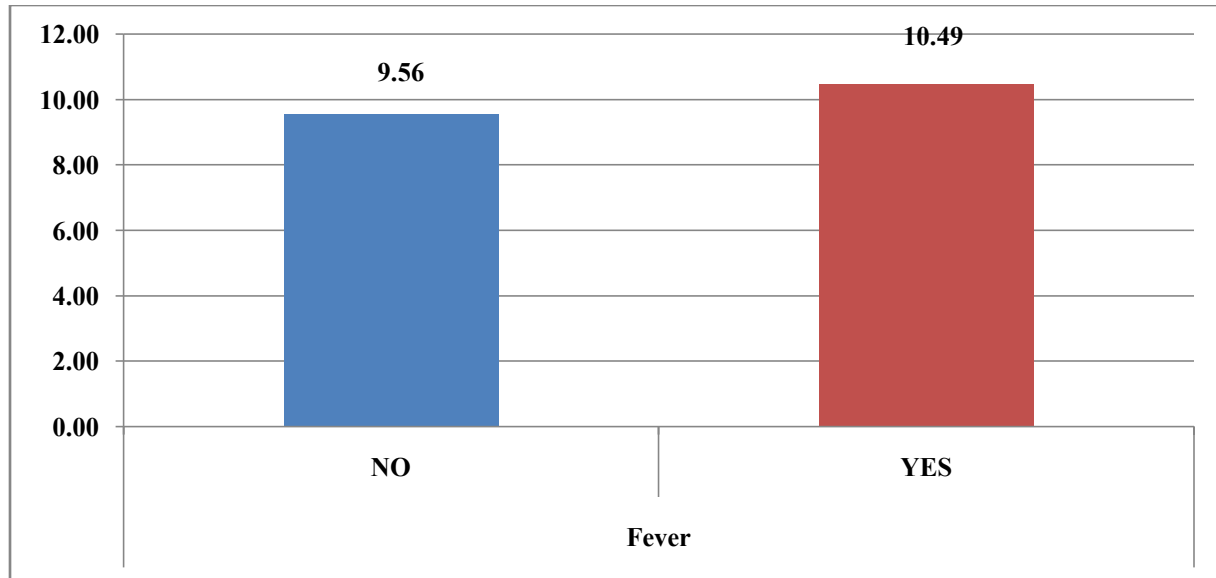
### Statistical methods:

Categorical variables are expressed as Patient number and percentage of patients and compared across groups using Pearson's Chi Square Independence of Attributes / Fisher's Exact Test as necessary. Continuous variables are expressed as Mean and Standard Deviation and compared as appropriate in the groups using Mann-Whitney U test / Kruskal Wallis Test. Association of duration of hospital stay and other Continuous variables are analyzed using Spearman's Rank correlation coefficient. For the study the statistical programme SPSS version 20 was used. An alpha level of 5 percent was taken, i.e. if any  $p$  value is less than 0.05 it was considered as important.

## Result and Analysis:-

**Table 1:-**The relation between Duration of hospital stay for patients with Fever.

Fever	Mean	Std. Deviation
NO	9.56	4.49
YES	10.49	5.26
p Value	0.467	
Significance	Not Significant	

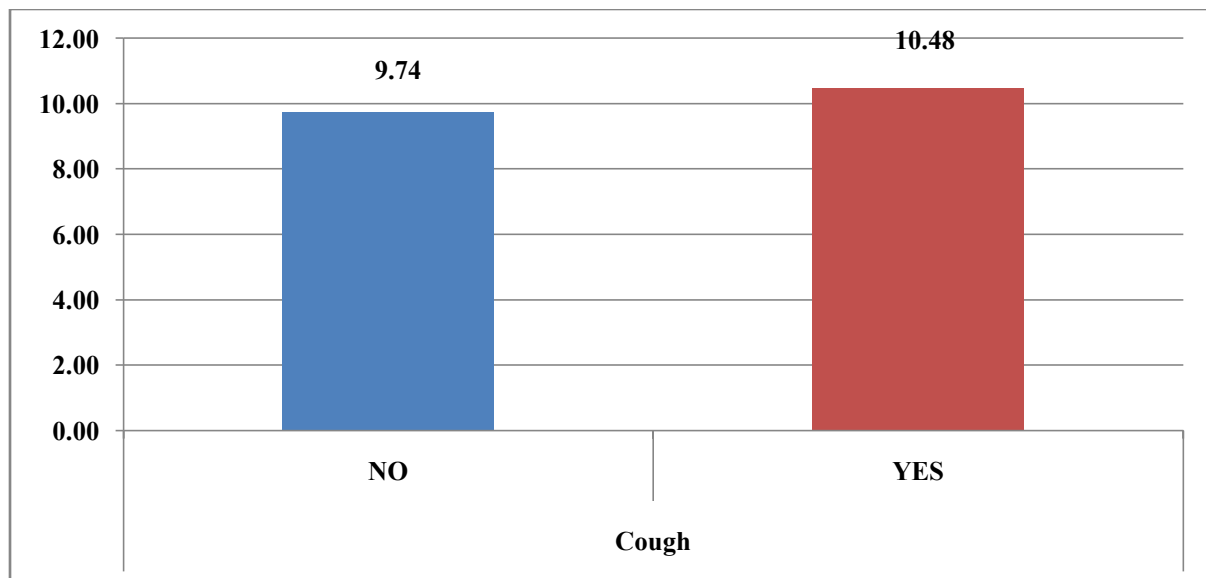


**Figure 1:-**The relation between Duration of hospital stay for patients with Fever.

The mean duration of hospital stay was 9.56 days for patients with fever and 10.49 days for patients without fever (Table 1 and Figure 1).

**Table 2:-** The relation between Duration of hospital stay for patients with Cough.

Cough	Mean	Std. Deviation
NO	9.74	4.75
YES	10.48	5.05
p Value	0.567	
Significance	Not Significant	



**Figure 2:-** The relation between Duration of hospital stay for patients with Cough.

Patients with cough had mean duration of hospital stay 9.74 days and it was 10.48 days for patients without cough (Table 2 and Figure 2).

**Table 3:-** The relation between Duration of hospital stay for patients with Ch.dis/Pain.

Ch.dis/Pain	Mean	Std. Deviation
NO	9.91	4.84
YES	11.00	4.58
p Value	0.550	
Significance	Not Significant	

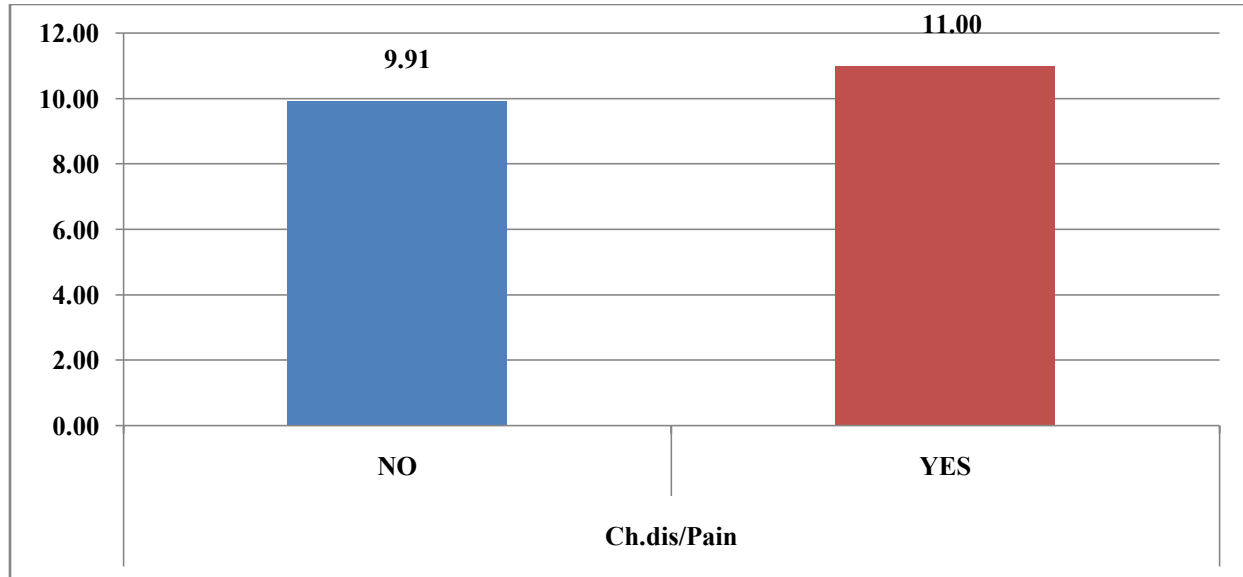


Figure 3:- The relation between Duration of hospital stay for patients with Ch.dis/Pain.

Mean duration of hospital stay for patients with chest pain/discomfort was 9.91 and for patients without chest pain/discomfort it was 11 days (Table 3 and Figure 3).

Table 4:- The relation between Duration of hospital stay for patients with Confusion.

Confusion	Mean	Std. Deviation
NO	9.86	4.77
YES	18.00	
p Value	0.130	
Significance	Not Significant	

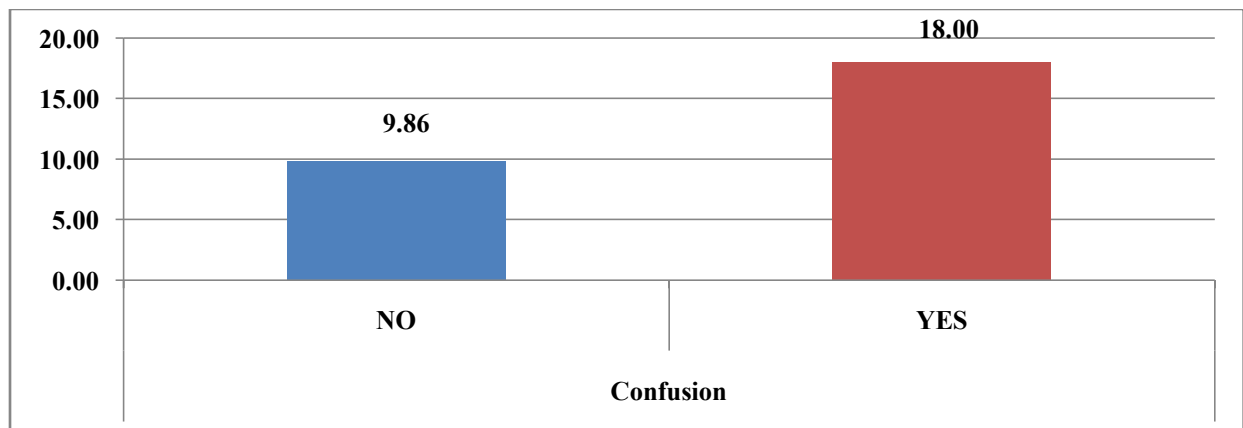
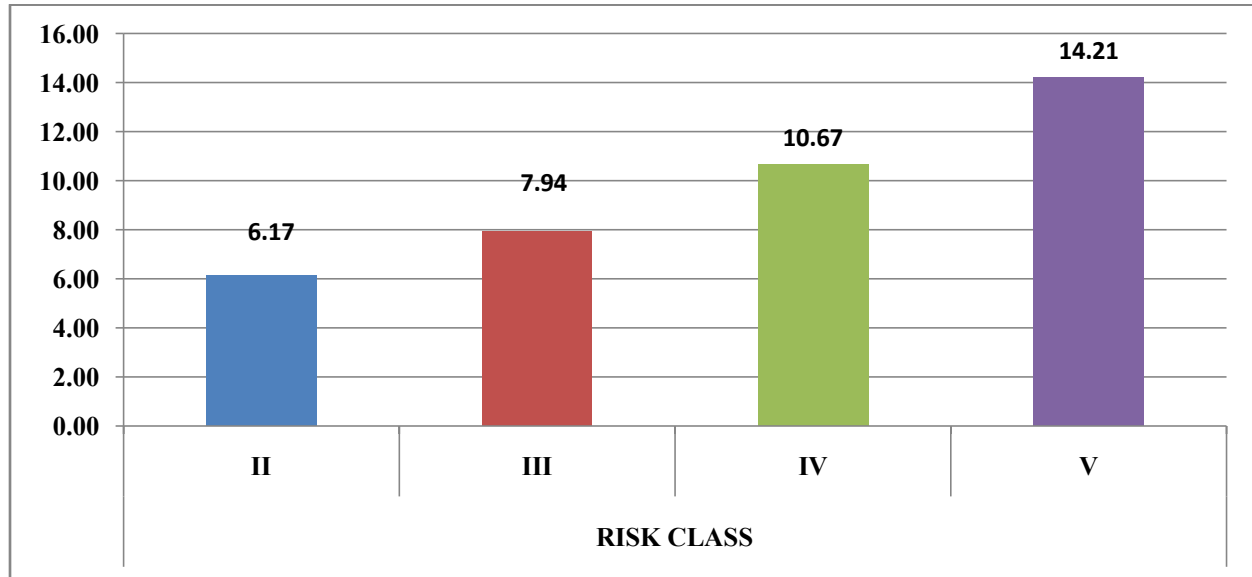


Figure 4:-The relation between Duration of hospital stay for patients with Confusion.

The relation between Duration of hospital stay and fever, cough, chest pain/discomfort, confusion was found to be not significant (Table 4 and Figure 4).

**Table 5:-** The relation between Duration of hospital stay for patients with Risk Class.

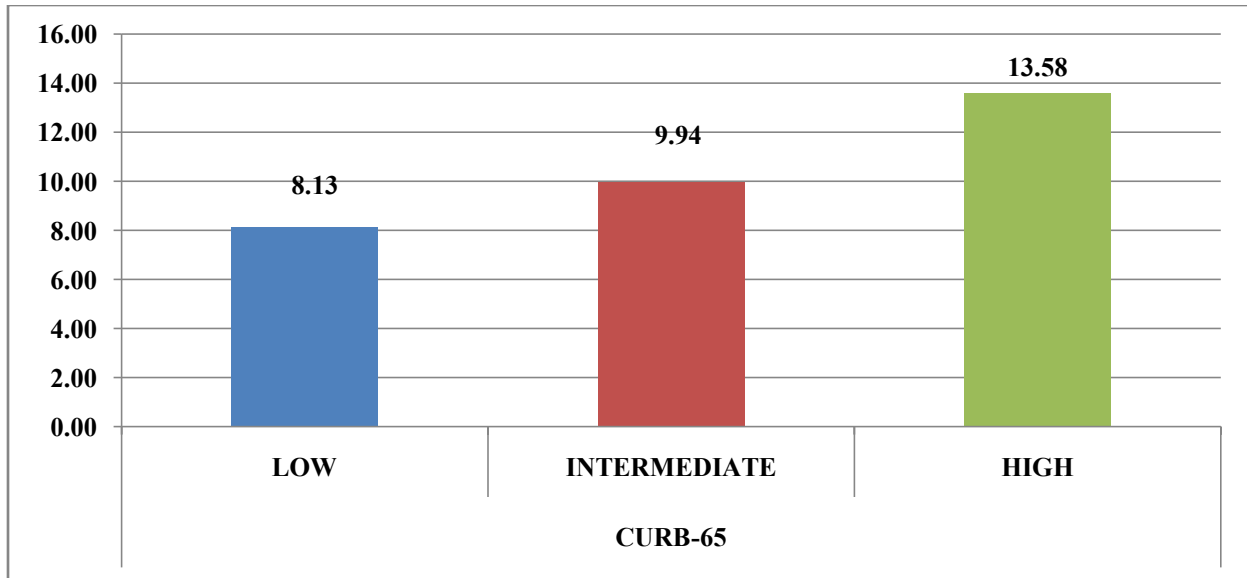
Risk Class	Mean	Std. Deviation
II	6.17	3.13
III	7.94	4.21
IV	10.67	4.16
V	14.21	5.41
p Value	<0.001	
Significance	Significant	

**Figure 5:-** The relation between Duration of hospital stay for patients with Risk Class.

However the relationship between duration of hospital stay and different risk classes of PSI was found to be significant (p value=<0.001). The duration of hospital stay increased as the PSI score increased (Table 5 and Figure 5).

**Table 6:-**The relation between Duration of hospital stay for patients with CURB-65.

CURB-65	Mean	Std. Deviation
Low	8.13	4.81
Intermediate	9.94	4.09
High	13.58	6.56
p Value	0.009	
Significance	Significant	

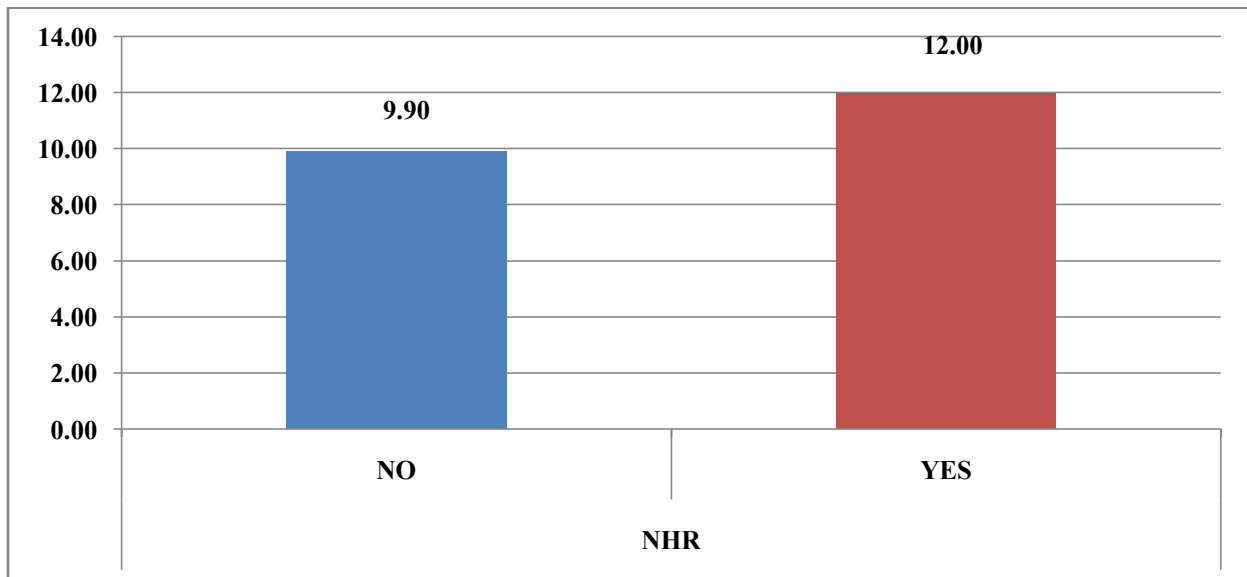


**Figure 6:-** The relation between Duration of hospital stay for patients with CURB-65.

As well as relationship between duration of hospital stay and different risk classes of CURB-65 score was found to be significant (p value=0.009), duration of hospital stay for low, intermediate and high risk groups was respectively 8.13,9.94 and 13.58 (Table 6 and Figure 6).

**Table 7:-** The relation between Duration of hospital stay for patients with NHR.

NHR	Mean	Std. Deviation
NO	9.90	4.86
YES	12.00	1.41
p Value	0.277	
Significance	Not Significant	



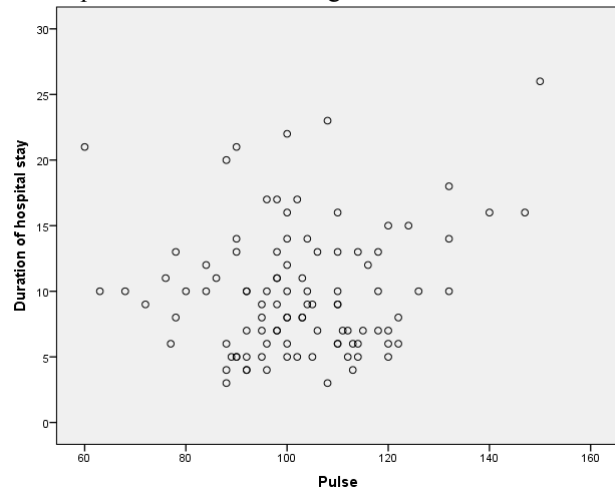
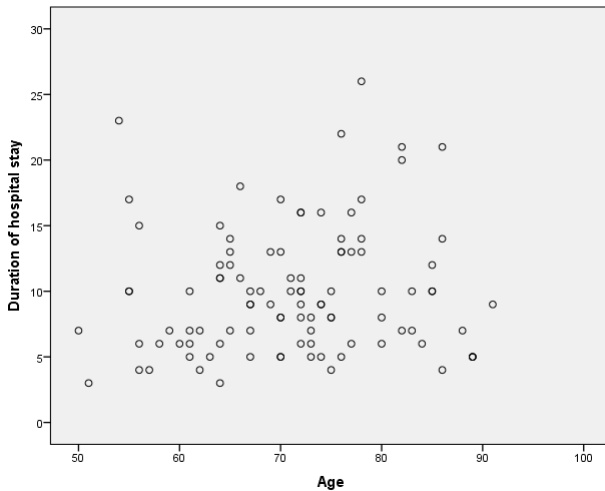
**Figure 7:-** The relation between Duration of hospital stay for patients with NHR.

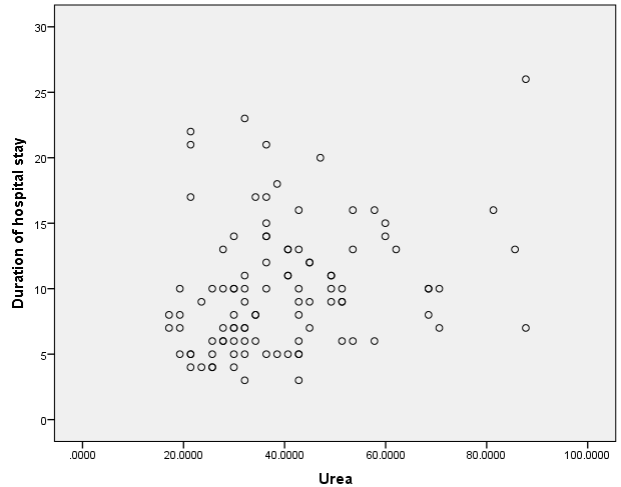
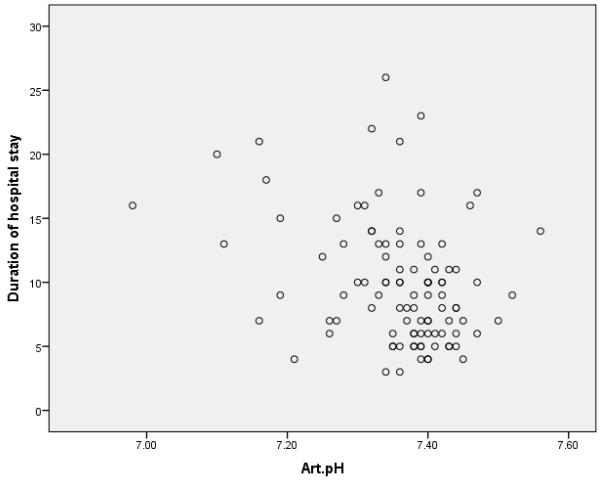
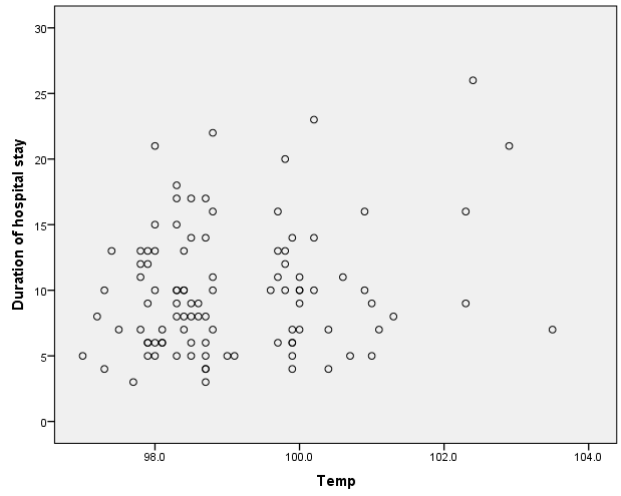
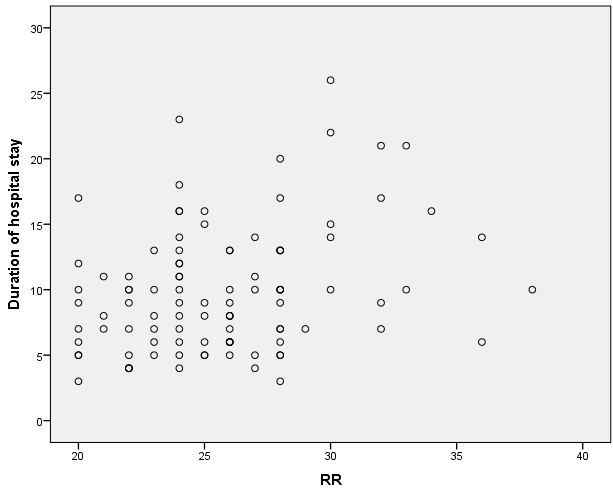
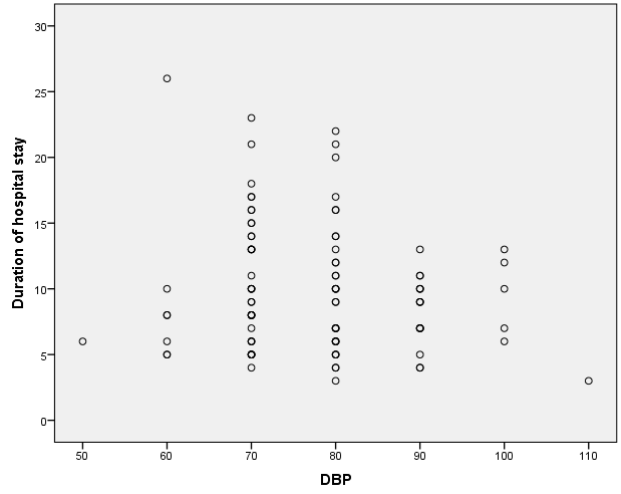
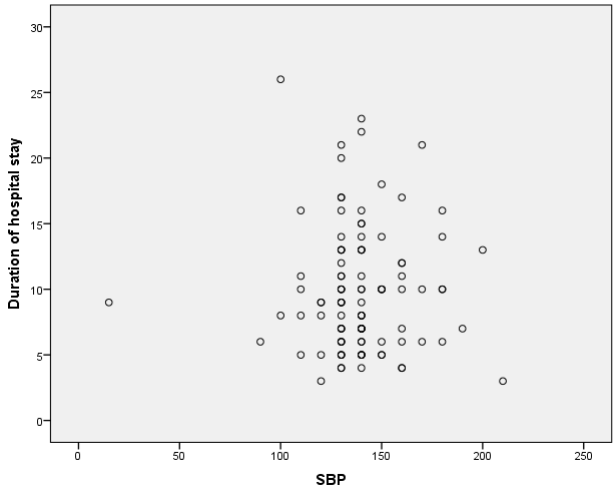
Duration of hospital stay for nursing home residents as compared to other patients was found to be not significant (Table 7 and Figure 7).

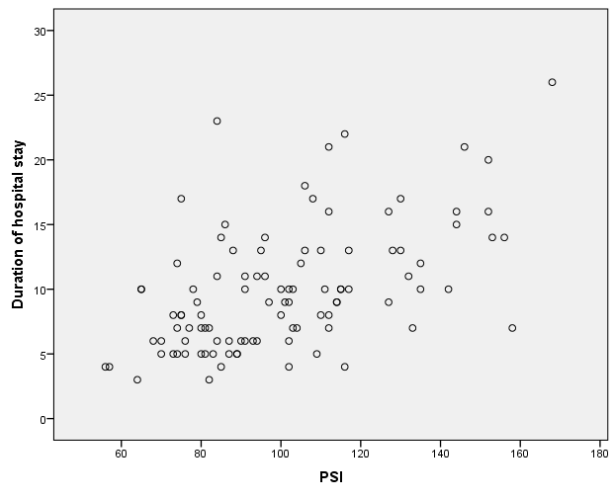
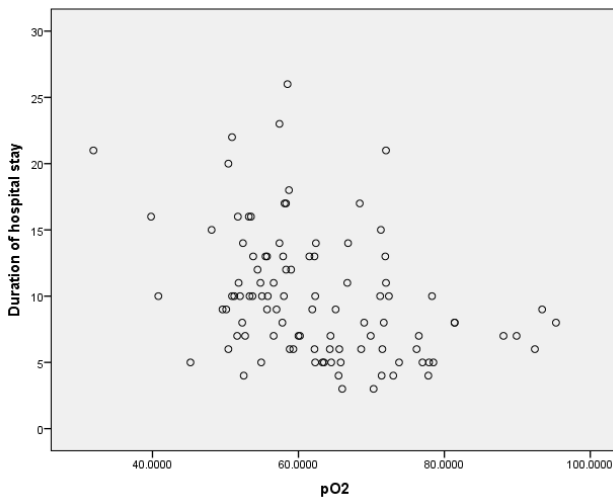
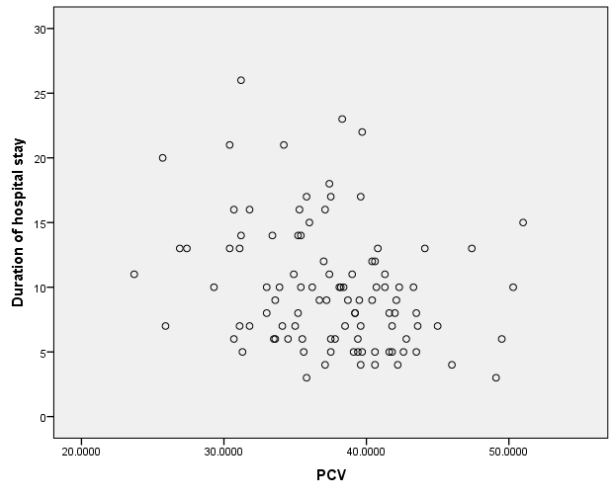
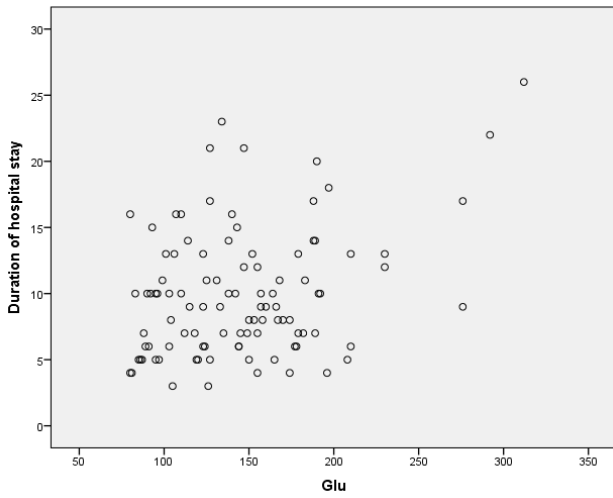
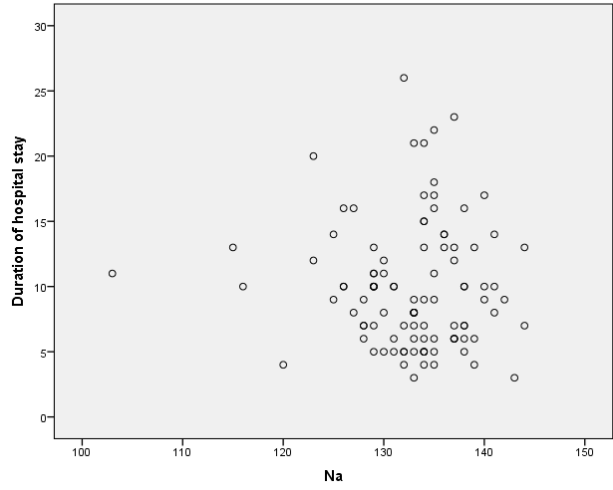
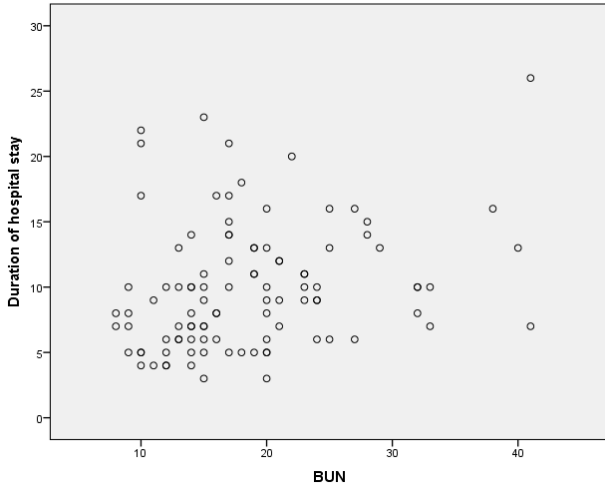
**Table 8:-** The relationship between Respiratory rate, Arterial pH, Urea and BUN levels, Blood glucose, Hematocrit level, pO2 as well as PSI and CURB-65 score in reference with duration of hospital.

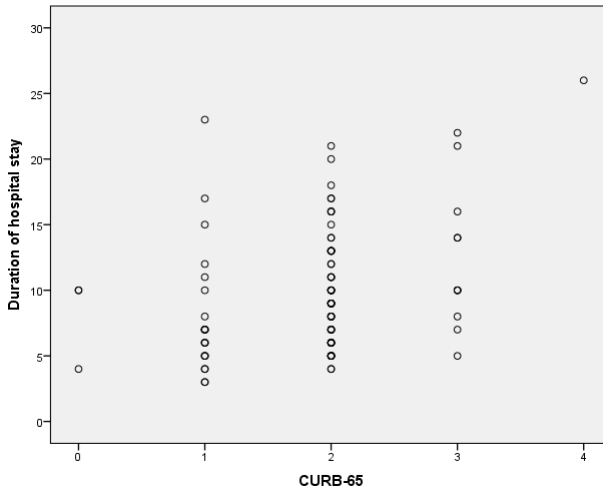
Spearman's rho		Duration of hospital stay	
		Correlation Coefficient	p Value
Age	Correlation Coefficient	0.124	
	p Value	0.217	
Pulse	Correlation Coefficient	0.076	
	p Value	0.450	
SBP	Correlation Coefficient	0.026	
	p Value	0.795	
DBP	Correlation Coefficient	-0.082	
	p Value	0.416	
RR	Correlation Coefficient	0.260	
	p Value	0.009	
Temp	Correlation Coefficient	0.099	
	p Value	0.327	
Art.pH	Correlation Coefficient	-0.286	
	p Value	0.004	
Urea	Correlation Coefficient	0.304	
	p Value	0.002	
BUN	Correlation Coefficient	0.304	
	p Value	0.002	
Na <sup>+</sup>	Correlation Coefficient	-0.035	
	p Value	0.733	
Glucose	Correlation Coefficient	0.214	
	p Value	0.032	
PCV	Correlation Coefficient	-0.293	
	p Value	0.003	
pO2	Correlation Coefficient	-0.392	
	p Value	0.000	
PSI	Correlation Coefficient	0.528	
	p Value	0.000	
CURB-65	Correlation Coefficient	0.308	
	p Value	0.002	

The relationship between Respiratory rate, Arterial pH, Urea and BUN levels, Blood glucose, Hematocrit level, pO2 as well as PSI and CURB-65 score in reference with duration of hospital was found to be significant.









**Figure 8:-** Graphs represents the correlation coefficients between Respiratory rate, Arterial pH, Urea and BUN levels, Blood glucose, Hematocrit level, pO<sub>2</sub> as well as PSI and CURB-65 score in reference with duration of hospital was found to be significant.

The above graphs represent the correlation coefficients (Figure 8).

### Discussion:-

The mean hospital stay period was 9.56 days for fever patients, and 10.49 days for fever-free patients. Cough patients had a median hospital stay of 9.74 days and patients without cough had 10.48 days.

Mean duration of hospital stay for patients with chest pain/discomfort was 9.91 days and for patients without chest pain/discomfort it was 11 days. The relation between Duration of hospital stay and fever, cough, chest pain/discomfort, confusion was found to be not significant.

However the relationship between duration of hospital stay and different risk classes of PSI was found to be significant ( $p$  value  $\leq 0.001$ ). The duration of hospital stay increased as the PSI score increased. It was observed that the mean duration for class II, III, IV and V was respectively 6.17, 7.94, 10.67 and 14.21 days. As well as relationship between duration of hospital stay and different risk classes of CURB-65 score was found to be significant ( $p$  value = 0.009), duration of hospital stay for low, intermediate and high risk groups was respectively 8.13, 9.94 and 13.58 days.

Duration of hospital stay for nursing home residents as compared to other patients was found to be not significant.

The relationship between Respiratory rate, Arterial pH, Urea and BUN levels, Blood glucose, Hematocrit level, pO<sub>2</sub> as well as PSI and CURB-65 score in reference with duration of hospital was found to be significant.

Our study revealed that PSI and CURB-65 score have good predictive capacity for in hospital deaths as well as duration of hospital stay.

Limitations of our study were- We did not collect information regarding the history of exacerbations. Our study consistent of small number of patients.

### Conclusion:-

PSI and CURB -65 can predict duration of hospital stay, with a good prognostic capacity. The role of PSI and CURB-65 in defining duration of hospital stay needs to be assessed by further studies on larger samples using Indian data for reference value. The present study is a stimulus to future research on role of PSI, CURB-65 as well as comorbidities in defining the outcome of acute exacerbations in COPD, one of the most dreaded respiratory diseases.

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