ORIGINAL RESEARCH PAPER

Pulmonary Medicine

ASSOCIATION BETWEEN THE LEVEL OF RED CELL DISTRIBUTION WIDTH (RDW) AND THE CURB65 SCORE OF PATIENTS WITH COMMUNITY PNEUMONIA AT THE BEGINNING OF THE TREATMENT PERIOD

KEY WORDS: Pneumonia, RDW, CRUB56

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ABSTRACT

The objective of this study was to examine the relationship between increased RDW levels and the prognosis of community pneumonia patients using the CRUB-65 method. This study is an analytical study with cross-sectional observation. This study was attended by 31 patients who had met the inclusion criteria. To see the relationship between RDW levels and CURB-65 scores, bivariate Spearman correlation analysis was used. The desired deviation ( ) is 0.05. Statistically significant if p <0.05. From this study, there is no relationship between the value of RDW levels on the CURB 65 score. The higher the RDW value, the CURB65 score will also be higher.

INTRODUCTION

Pneumonia is one of the main causes of high morbidity and mortality throughout the world. Community Pneumonia (PK) mortality rates range from less than 5% in outpatients and up to 12% in hospitalized patients.[1] Mar Masia, et al. Reported that of the 240 patients studied the most common causes of pneumonia were bacteria (39 people), atypical (36 people), viruses (15 people), combined (14 people), unknown (81 people).[2]

Assessment of disease severity and predicting prognosis in PK patients is important for adequate care and treatment options in PK management. Therefore various scoring systems to determine PK severity have developed and are widely used, including PSI (Pneumonia Severity index), PORT (Patients Outcomes Research Team Score), and CURB-65 (Confusion, Urea, Respiratory rate, Blood pressure, Age> 65 years).[1,3,4]

The British Thoracic Society (BTS) proposes the use of CURB-65 with a 5 point scoring system and three risk categories: 0-1 (low risk of mortality; class 0 = 0.7%; class 1 = 3.2%), 2 (Risk of death between = 13%) and> 3 (high risk of death; class 3 = 17%; class 4 = 41.5%; class 5 = 57%). This severity score, introduced in 2003, is now widely validated in more than 12,000 patients from several different countries. Studies that assess CURB-65 have shown it to be a fairly accurate tool with moderate to good discriminatory values (AUC values ranged from 0.73 to 0.83) for predictions of 30-day mortality.[5,6]

RDW, which is one of the erythrocyte indices, is a statistical concept that measures the variation in the size of red blood cells. This step reflects the heterogeneity of the volume of red blood cells and is a component of the complete blood count (Complete Blood Count / CBC). Until now, the clinical significance of RDW has been limited to differential diagnosis of anaemia; However, recent reports linking increased RDW can predict severe mortality and morbidity in cardiovascular conditions, rheumatoid arthritis, colon cancer and metabolic syndrome. The mechanism of causing an increase in RDW in some unknown conditions is assumed to be related to an inflammatory process that might interfere with the erythropoiesis process.[7,8]

In a study conducted by Bello, et al., It was known that RDW, associated with clinical scores, could provide useful information about the prognosis of long-term PK.[9,10] The study conducted by Lee also found that changes in RDW from day 1 to day 4 were independent predictors of mortality in patients with PK.[8,11] RDW is associated with 30 days mortality, hospital stay, and vasopressor use in hospitalized patients with PK. The inclusion of RDW improved the prognostic performance of PSI and CURB-65.[8,12]

Karatas conducting research in geriatric patients also found that RDW levels, old age and the presence of Alzheimer's disease correlated with mortality in elderly subjects (≥ 90 years) with PK.[13,14] A new study also showed that PK patients with increased RDW in patients at the time of admission, either alone or in combination with white blood cell levels, were associated with death and other complications obtained during hospital treatment. This prompted researchers to conduct further research on the relationship between increasing RDW levels and the prognosis of community pneumonia patients calculated using the CRUB-65 method at the time of initial hospital admission. Thus, it is expected that PK awareness and handling in hospitals can be further improved so that it can reduce the morbidity and mortality of patients with a diagnosis of PK.

METHODS

Patient Selection

This research is an analytical study with cross-sectional observation. With one observation, RDW values and CURB-65 values from community pneumonia patients were sampled in this study. This study was attended by 31 patients who had met the inclusion criteria.

Community pneumonia is an acute infection of the pulmonary parenchyma associated with at least some symptoms of acute infection, accompanied by a picture of acute infiltrates on chest radiology or auscultation findings that are suitable for pneumonia (changes in breath sounds or local rocks) in people who are not hospitalized or not be in a long-term care facility for ≥ 14 days before the onset of symptoms or in hospital care ≤ 48 hours.

RDW is assessed by a complete automated haematology analyzer with simultaneous analysis of 18 parameters in whole blood mode and capillary blood mode. The severity of pneumonia is assessed based on the CURB-65 score. Written informed consent was obtained from all participants or their caregivers. This study was approved by the Institutional Review Board of Universitas Sumatera Utara.

RDW and CRUB65

After fulfilling the inclusion and exclusion criteria, the patients were taken blood samples in the fossa cubiti area of the study subjects to complete blood tests, urea, creatinine, RDW, blood sugar levels, blood gas analysis, electrolytes (sodium) and / sputum / ST culture in community pneumonia patients. Blood collection is carried out by laboratory analysts.

Assessed the severity of pneumonia with the CURB-65 score in accordance with the guidelines of the British Thoracic Society (BTS)

with 2 5 point scoring systems with three risk categories: 0-1 (low risk of mortality; class 0 = 0.7%; class 1 = 3.2%), 2 (Death risk between = 13%) and> 3 (high risk of death; class 3 = 17%; class 4 = 41.5%; class 5 = 57%). RDW levels were measured using the chromatography method.

Statistical analysis

Univariate and bivariate analyses were performed using statistical software programs. Univariate analysis to display data on the basic characteristics of the study population is used tabulation to show a descriptive picture. Normality test using Kolmogorov-Smirnov. Bivariate analysis to see the relationship of RDW levels based on their level of severity of community pneumonia with CURB-65 scores used Spearman correlation. The desired deviation ( ) is 0.05. Statistically significant if p <0.05.

RESULTS

A total of 13 patients (41.9%) were male and 18 patients (58.1%) were women with respondents aged ≤ 40 years as many as 8 people (25.8%) and respondents aged> 40 years as many as 23 people (74.2%).

Table 1. Baseline Characteristics

Characteristic	n (%)
Sex	
Male	13 (41,9)
Female	18 (58,1)
Age	
Mean, Median, Min-Max, SD	53,83, 55, 21-85, 16,90
≤ 40 years	8 (25,8)
> 40 years	23 (74,2)
Confusion	
Compos Mentis	14 (45,2)
Unconsious	17 (54,8)
Systolic Blood Pressure	
Mean, Median, Min-Max, SD	104,83, 110, 70-150, 21,58
< 90 mmHg	8 (25,8)
≥ 90 mmHg	23 (74,2)
Respiratory Rate	
Mean, Median, Min-Max, SD	29,35, 30, 24-30, 1,30
< 30 x/i	8 (25,8)
≥ 30 x/i	23 (74,2)
Leukocytes (x10^3 mm3)	
Mean, Median, Min-Max, SD	14846,45, 14150, 3620-28140, 6287,57
< 4 or > 12	20 (64,5)
4-12	11 (35,5)
Blood glucose	
Mean, Median, Min-Max, SD	184,82, 137, 80-547, 133,78
≤ 250 mg/dL	20 (64,5)
> 250 mg/dL	11 (35,5)
Blood Urea Nitrogen	
Mean, Median, Min-Max, SD	28,48, 26, 5-79, 18,05
< 20 mg/dL	11 (35,5)
≥ 20 mg/dL	20 (64,5)
Creatinin	
Mean, Median, Min-Max, SD	1,39, 0,79, 0,48-16,93, 2,90
≤ 1,5 mg/dL	15 (48,4)
> 1,5 mg/dL	16 (51,6)
Albumin	
Mean, Median, Min-Max, SD	2,67, 2,5, 1,8-4,2, 0,51
2,5-3,4 g/dL	22 (71,0)
<2,5 g/dL	9 (29,0)
Natrium	
Mean, Median, Min-Max, SD	132,29, 134, 110-139, 6,99
< 130 mEq/L	8 (25,8)
130-150 mEq/L	23 (74,2)
CURB65	
Mean, Median, Min-Max, SD	2,51, 3, 0-5, 1,31
Ringan (≤2)	15 (48,4)
Sedang – Berat (>2)	16 (51,6)
RDW	
Mean, Median, Min-Max, SD	13,96, 13,7, 11,6-18,1, 1,61
≤ 15 %	15 (48,4)
> 15 %	16 (51,6)
pH	
Mean, Median, Min-Max, SD	7,43, 7,43, 7,20-7,84, 0,20
O2 Saturation	
Mean, Median, Min-Max, SD	99,22, 100, 95,3-100, 1,11

There is a relationship between sex, confusion, systolic blood pressure, respiratory rate, and blood glucose with a CURB65 score (p < 0.05). There is no relationship for the other parameter (Table 2)

Table 2. Statistical Test Results for the CURB65 Score

Variable	CURB65 Score		p
	≤ 2 (Mild)	>2 (Moderate – Severe)	
Sex			0,048*
Male	9 (69,2)	4 (30,8)	
Female	6 (33,3)	12 (66,7)	
Age			0,618
≤ 40 Years	4 (50,0)	4 (50,0)	
> 40 Years	11 (47,8)	12 (52,2)	
Confusion			0,000*
Consious	13 (92,9)	1 (7,1)	
Unconsious	2 (11,8)	15 (88,2)	
Systolic Blood Pressure			0,023*
< 90 mmHg	1 (12,5)	7 (87,5)	
≥ 90 mmHg	14 (60,9)	9 (39,1)	
Respiratory Rate			0,014*
< 30 x/i	7 (87,5)	1 (12,5)	
≥ 30 x/i	8 (34,8)	15 (65,2)	
Blood Urea Nitrogen			0,611
< 20 mg/dL	6 (54,5)	5 (45,5)	
≥ 20 mg/dL	9 (45)	11 (55)	
Leukocyte (x103mm3)			0,809
< 4 or > 12	10 (50,0)	10 (50,0)	
4-12	5 (45,5)	6 (54,5)	
Blood Glucose			0,044*
≤ 250 mg/dL	7 (35,0)	13 (65,0)	
> 250 mg/dL	8 (72,7)	3 (27,3)	
Albumin			0,546
2,5-3,4 g/dL	11 (50,0)	11 (50,0)	
< 2,5 g/dL	4 (44,4)	5 (55,6)	
Creatinin			0,853
≤ 1,5 mg/dL	7 (46,7)	8 (53,3)	
> 1,5 mg/dL	8 (50,0)	8 (50,0)	
Natrium			0,382
< 130mEq/L	3 (37,5)	5 (62,5)	
130-150mEq/L	12 (52,2)	11 (47,8)	
RDW			0,366
≤ 15 %	6 (40)	9 (60)	
> 15 %	9 (56,3)	7 (43,7)	

*p<0.05

There is a relationship between respiratory frequency with a CURB65 score (p = 0.009) and r value = 0.464. the higher the respiratory frequency, the higher the value of CURB65, and vice versa (Figure 1)

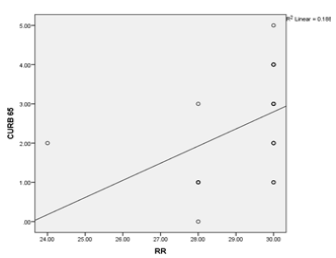

Figure 1. Graph of Spearman Correlation between Respiratory Frequency and CURB 65

There was no association between blood sugar levels and CURB65 scores (p = 0.197). However, the value of r = -0.238 indicates that the higher the blood sugar level, the lower the value of CURB65 (Figure 2).

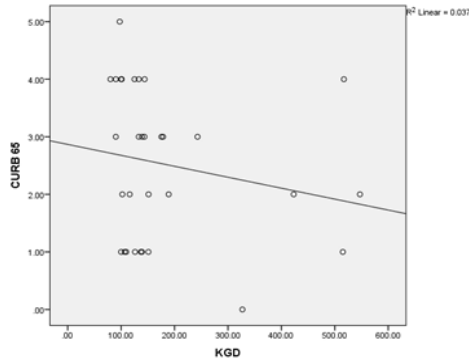

Figure 2. Spearman Correlation Graph between Blood Sugar Levels and CURB65

There is no correlation between pH level and CURB65 score (p = 0.140) and the value of r = 0.271 shows that the higher the pH value, the higher the CURB65 value (Figure 3).

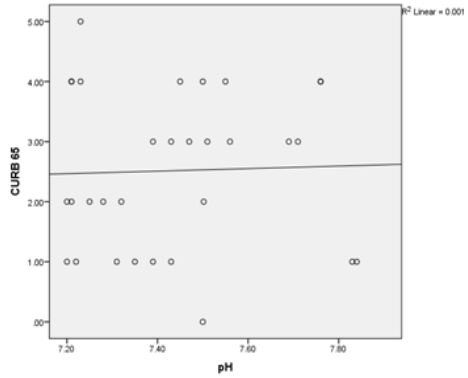

Figure 3. Spearman Correlation Graph between pH and CURB65

There is no relationship between the O2 Saturation level and the CURB65 score (p = 0.124) and the value r = -0.282 indicates that the higher the saturation level of O2, the lower the CURB65 value, and vice versa (Figure 4).

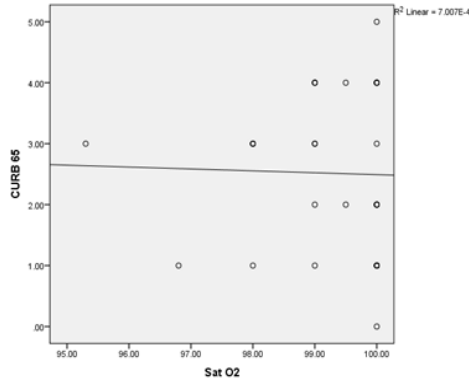

Figure 4 Spearman Correlation Graph between O2 Saturation Level and CURB65

On examination of RDW values, found 60% of respondents in the group with RDW ≤ 15% who belonged to the group with moderate-severe CURB65 score (60%), while in groups with RDW values> 15%, there were scores of 56.3% of respondents in group with a mild CURB65 score, with a value of p = 0.366 which means that there is no relationship between the RDW value and the CURB65 score. Similarly, with the Spearman correlation test below, it can be seen that there is no relationship between the RDW value and the CURB65 score (p = 0.852). (Table 3)

Table 3. Spearman Correlation Test Results on CURB65 Score

Variable	CURB65 Score	
	P	r (Correlation)
Systolic blood pressure	0,013	-0,442
Respiratory Rate	0,009	0,464
Blood Glucose	0,197	-0,238
pH	0,140	0,271
O2 Saturation	0,124	-0,282
RDW	0,852	0,033

There is no relationship between the RDW value and the CURB65 score (p = 0.366). Although the Spearman correlation test also shows no relationship between the RDW value and the CURB65 score (p = 0.852), the value of r = 0.033 indicates that the higher the RDW value, the higher the CURB65 value, the more severe the patient's clinical meaning (Figure 5).

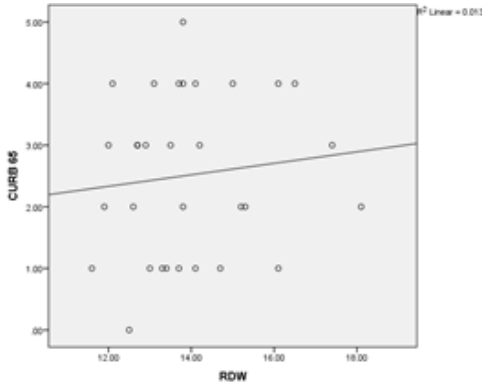

Figure 5. Spearman Correlation Graph between RDW value and CURB65 score

DISCUSSION

In the results of the study, it was found that there was a relationship between sexes with a CURB65 score (p = 0.048). However, different results were stated in a study conducted by Bello et al. (2015) in 265 people in Spain who through their univariate tests stated that there was no relationship between sex and predictive factors of mortality (p = 0.346). In this study, it was stated that gender did not show a relationship to the mortality of the first 28 days with a value of p = 0.115.[15] A different result was also found by Braun, et al. (2014) in his Israeli study of 3815 people, where Braun, et al. Found no association between sex and predictive factors of 90 days mortality (p = 0.91).[16] Different results were also found by Lee, et al. (2016) through his research in Korea, which stated that there was no relationship between sex with a 30-day mortality rate (p = 0.97).[17] Different results were also found by Zhang et al. (2018) in Singapore at 1,902 patients, which stated there was no relationship between sex with prognostic factor mortality (p = 0.063).[18] This might be due to differences in the comparison of the number of male and female patients who were the subjects of the study, where the number of patients involved in this study amounted to only 31 people.

Apart from the sex comparison of the CURB65 score, the results of the study also stated that there was a relationship between consciousness status and CURB65 score (p = 0,000). This result is in accordance with a study conducted by Bello et al. (2015) in Spain which through its univariate test stated that there was a relationship between the patient's status of consciousness and predictive factors of mortality (p <0.001).[15] This result is also consistent with the research conducted by Lim, Lewis, and Macfarlane (2000) in the United Kingdom who, through its univariate test, stated that there was a relationship between the patient's awareness status and the mortality rate (p <0.001).[19] The same results are also shown by the research conducted by Lim, et al. (2002) with populations originating from 3 different countries, namely England, New Zealand and the Netherlands, which through their univariate tests stated that there was a relationship between the patient's consciousness status and the 30-day mortality rate (p <0.001).[20] The same results were also shown by research conducted by Shehata, Sileem, and Shahien (2017) in Egypt who, through their univariate tests, stated that there was a

relationship between the patient's awareness status and the 30-day mortality rate (p <0.001).[21]

The study also stated an association between systolic blood pressure and CURB65 score (p = 0,000). This result is similar to a study conducted by Bello et al. (2015) in Spain which through its univariate test stated that there was a relationship between blood pressure and predictive mortality factors (p = 0.033).[15] The same results were also found by Ahn and Choi (2018) in Korea which stated that there was a relationship between systolic blood pressure and the first 28 days mortality rate with a value of p = 0.047.[22] The same results were also found by Zhang, et al. (2018) in Singapore, which stated an association between systolic blood pressure and prognostic factor mortality (p = 0.002).[18] The same results are also shown by the research conducted by Lim, et al. (2002) who through their univariate tests stated that there was a relationship between low systolic and diastolic blood pressure with a 30-day mortality rate (p <0.001).[20] The same results were also shown by research conducted by Shehata, Sileem, and Shahien (2017) in Egypt which through its univariate test stated that there was a relationship between systolic blood pressure and 30-day mortality rate (p = 0.007).[21] However, this result is different from the study conducted by Braun, et al. (2014) in Israel which through its univariate test stated that there was no correlation between blood pressure and 90 days mortality rate (p = 0.457). However, it should be noted that the majority of patients (96.6%) studied in the Braun study, et al (2014) in Israel, had systolic blood pressure ≥ 90 mmHg.[16] Different results are also shown by the research conducted by Lim, Lewis, and Macfarlane (2000) in the United Kingdom who, through its univariate test, stated that there was no association between systolic blood pressure and mortality (p = 0.47). However, in their study, they used a systolic blood pressure limit that was classified as ≥141 mmHg, 131–140 mmHg, 111–130 mmHg, and ≤110 mmHg.[19]

The results of the study also found a correlation between respiratory frequency and CURB65 score (p = 0.014). This result is similar to a study conducted by Bello et al. (2015) in Spain which through its univariate test stated that there was a relationship between respiratory frequency and predictive mortality factors (p = 0.011).[15] The same results were found by Ahn and Choi (2018) in Korea who stated that there was a correlation between respiratory frequency and mortality for the first 28 days with a p <0.001.[22] This result is also in accordance with the research conducted by Lim, Lewis, and Macfarlane (2000) in the United Kingdom which through its univariate test states that there is a relationship between respiratory frequency and mortality rate (p = 0.04).[19] The same results are also shown by the research conducted by Lim, et al. (2002) which through its univariate test stated that there was a relationship between respiratory frequency ≥30x / minute with a 30-day mortality rate (p <0.001).[20] The same results were also shown by research conducted by Shehata, Sileem, and Shahien (2017) in Egypt who, through their univariate tests, stated that there was a relationship between the patient's awareness status and the 30-day mortality rate (p = 0.026).[21] However, different results were found by Zhang et al. (2018) in Singapore, which states an association between respiratory frequency and prognostic mortality factors (p = 0.08).[18]

This study stated that there was an association between blood sugar levels and CURB65 scores (p = 0.044). This result is similar to a study conducted by Braun, et al. (2014) in Israel which through its univariate test stated that there was a relationship between blood sugar levels and 90 days mortality rate (p = 0.002).[16] Different results were found by Bello et al. (2015) in Spain who, through their univariate tests, stated that there was no association between blood sugar levels> 250 mg / dL and predictive factors of mortality (p = 0.093).[15] Different results were found by Zhang, et al. (2018) in Singapore, which states that there is no correlation between respiratory frequency and prognostic mortality factors (p = 0.60).[18] Different results were also found by Lee, et al. (2016) through his research in Korea, which through regression correlation tests revealed no association between blood sugar levels and 30-day mortality rates (p = 0.39). This might be due to differences in blood sugar levels which in this study, found a mean blood sugar level of 184.82 mg / dL, whereas in the study of Lee et al. (2016) with a mean blood sugar level in the study sample 159.4 ± 91.7 mg / dL. Blood sugar levels when unable to express a person's glycemic status are controlled or not.[17]

The results of the statistical test of this study are different from the research conducted by Bello, et al. (2015) in Spain which through its univariate test states that there is a relationship between the RDW value and predictive mortality factors (p <0.001) as well as the research conducted by Braun, et al. 2014, where in their study it was found that there was an association between RDW values and 90-day mortality (p <0.001).[15-16] The same results were also supported by Lee, et al. (2016) through his research in Korea, which through the regression correlation test stated that there was a relationship between the RDW value and the 30-day mortality rate (p <0.05), with the average RDW value in the study sample 14.8 ± 1.9%.[17]

The study by Bello et al. Also stated that RDW was also associated with a 30-day mortality rate (p = 0.017), 90 days (p = 0.004) 180 days (p <0.0001), 1 year (p <0,0001), 2 year (p <0,0001) to 3 years (p <0,0001).[15] In accordance with research conducted by Perlstein et al. (2009), it can be seen that the higher the RDW value, the mortality rate increases. The results of research conducted by Perlstein et al. (2009) showed a hazard ratio of 1.32-1.36 in the mortality rate of chronic lower respiratory disease.[23]

The difference in the results of the research shown can be due to the fact that there are very many factors that determine patient outcomes that are directly related to CURB65 scoring or not, such as age, where the average age in this study sample ranged from 53 years, while the age limit used in the scoring system CURB65 is 65 years old. This is supported by Lim, et al. (2012) which showed, that in the age range <65 years, there was no significant relationship to the 30-day mortality rate (p = 0.9), but in the age group 65-74 years, 75–84 years, and> 85 year, there was a significant relationship to the 30-day mortality rate (p = 0.03; p <0.001; p <0.001), and was different in this study which stated no association between age and CURB65 score (p = 0.618).[20] In addition, other factors, such as the number of samples in this study, are fairly low at 31 people, also affecting the results of the statistical analysis conducted. As well as the selection of samples where the patients used in this study came from patients who initially entered the hospital, different from other studies, where the sample used in other studies came from patients suffering from other serious illnesses, and some of them needed ICU care.

CONCLUSION

1. There is no correlation between the RDW level value and the CURB 65 score
2. The higher the RDW value, the higher the CURB65 score.

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