Methods:

The daily data of COVID-19 cases and deaths in Bangladesh's division, district, and sub-district of Noakhali are in the form of a continuous variable, and the correlation values in Tables 1 and 2 confirm that the active cases are reliant on the arsenic variable. To calculate and comprehend the effects of a linear relationship between two continuous variables, linear regression analysis and correlation analysis are used. The values that coefficients of association might take on range from uncorrelated (zero) through positive correlations (+1) to negative correlations (1). The direction of the relationship depends on whether the correlation coefficient is positive or negative. The absolute value, which is extremely close to +1, demonstrates the strength of the linear relationship (Tables 1 and 2).

The relative impact of active cases and deaths resulting from daily positive cases and deaths in Noakhali as well as in the case of Bangladesh data is assessed using a linear regression model. Fitting a straight line with the data predicts Y for X, where Y is the total number of daily active cases and deaths, and X is the level of arsenic, is the main objective of linear regression. Estimating the intercept and slope regression parameters, which define the line, is frequently done using the least squares method.

Table 1: Relation between top Division wise COVID-19 cases and deaths with Arsenic rate in Bangladesh

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cases | | | Deaths | | |
| Estimate | 95% CI | P-value | Estimate | 95% CI | P-value |
| 9.31 | -3.01 to 21.63 | 0.189 | 10.87 | -3.09 to 24.82 | 0.178 |
| Correlation Coefficient, r = 0.517 | | R-squared = 26.78% | Correlation Coefficient, r = 0.529 | | R-squared = 27.96% |

Table 1 shows the Spearman's correlation coefficients among the total confirmed cases and deaths of COVID-19 by Division-wise data. Total cases had lower significant positive Spearman's correlations with Arsenic (r = 0.517, p = 0.189), and almost similar relation with deaths data (r = 0.529, p = 0.178). The estimate of linear relation shows that for each 1 ppb rise in Arsenic, there is almost ten times increase in the cumulative daily number of COVID-19 confirmed cases and almost 11 times increase in the cumulative daily number of COVID-19 confirmed deaths. Table 1 also summarizes the R-squared results. Findings suggest that these factors have a reasonable contribution to explaining the behavior of the COVID-19, at least for this linear model.

Table 2: Relation between District wise COVID-19 cases and deaths with Arsenic rate in Bangladesh

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cases | | | | | Deaths | | | | |
| Estimate | 95% CI | | P-value | | Estimate | 95% CI | | P-value | |
| 10.15 | -3.69 to 23.99 | | 0.156 | | 15.53 | 1.13 to 29.92 | | 0.039 | |
| Correlation Coefficient, r = 0.032 | | R-squared = 3.23% | | Correlation Coefficient, r = 0.259 | | | R-squared = 6.73% | |

Table 2 shows the Spearman's correlation coefficients among the total confirmed cases and deaths of COVID-19 by District-wise data. Total cases had lower significant positive (so poor) Spearman's correlations with Arsenic (r = 0.032, p = 0.156), but the relation with deaths data is statistically significant (r = 0.259, p = 0.039). Though, they have a lower correlation coefficient. However, the estimate of linear relation shows that for each 1 ppb rise in Arsenic, there is almost ten times increase in the cumulative daily number of COVID-19 confirmed cases and almost 16 times increase in the cumulative daily number of COVID-19 confirmed deaths. Table 2 also summarizes the R-squared results. Findings suggest that these factors have a not shown good contribution to explaining the behavior of the COVID-19 with district data.

Figure 1: Scatter plot with regression line between total cases and deaths with Arsenic rate.



Table 3: Relation between Noakhali District COVID-19 cases with Arsenic rate in Bangladesh

|  |  |  |  |
| --- | --- | --- | --- |
| Cases | | | |
| Estimate | 95% CI | | P-value |
| 6.15 | -7.97 to 20.28 | | 0.421 |
| Correlation Coefficient, r = 0.307 | | R-squared = 9.43% | |

Table 3 shows the Spearman's correlation coefficients among the total confirmed cases of COVID-19 by Noakhali sub-district data. Total cases had lower significant positive Spearman's correlations with Arsenic (r = 0.307, p = 0.421). However, the estimate of linear relation shows that for each 1 ppb rise in Arsenic, there is almost six times increase in the cumulative daily number of COVID-19 confirmed cases. Table 2 also summarizes the R-squared results. Findings suggest that these factors have a not shown good contribution to explaining the behavior of the COVID-19 with Noakhali sub-district data.

Figure 2: Scatter plot with regression line between total cases and deaths with Arsenic rate.

