



Government of Nepal
Ministry of Forest and Environment
Department of Environment
Babarmahal, Kathmandu

Air quality status of Nepal 2016-2020

Volume XVII

Damak air quality monitoring station



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Contents

1.Damak Air Quality Monitoring Station.....	4
2.Air Quality Status of Damak station (2019-2020)	6
2.1 Air Quality status, 2019	6
2.1.1 Temporal variation of PM1	6
2.1.2 Temporal variation of PM2.5	9
2.1.3 Temporal variation of PM10	12
2.1.4 Temporal variation of TSP	15
2.2 Air Quality Status, 2020	18
2.2.1 Annual average of PM1, PM2.5, PM10 and TSP	18
2.2.2 Temporal Variation of PM1	18
2.2.3 Temporal Variation of PM2.5.....	22
2.2.4 Temporal Variation of PM10.....	26
2.2.5 Temporal Variation of TSP.....	30

List of Figure

Figure 1. Histogram of PM1 at Damak station in 2019	6
Figure 2. Daily average PM1 at Damak station in 2019.....	7
Figure 3. Monthly Average of PM1 at Damak Station in 2019	7
Figure 4. Boxplot of monthly variation of PM1 at Damak station in 2019	8
Figure 5. Boxplot of diurnal variation of PM1 at Damak in 2019	8
Figure 6. Histogram of PM2.5 at Damak station in 2020	9
Figure 7. Daily average PM 2.5 at Damak station in 2019	9
Figure 8. Monthly average PM2.5 at Damak station in 2019.....	10
Figure 9. Boxplot of Monthly variation of PM2.5 at Damak station in 2019.....	10
Figure 10. Boxplot of PM2.5 at Damak station in 2019	11
Figure 11. Compliance status of PM2.5 at Damak with NAAQS	11
Figure 12. Histogram of PM10 at Damak station in 2019.....	12
Figure 13. Daily average PM10 at Damak station in 2019	12
Figure 14. Monthly average PM10 at Damak station in 2019.....	13
Figure 15. Boxplot of monthly variation of PM10 at Damak in 2019	13
Figure 16. Boxplot of diurnal variation of PM10at Damak in 2019.....	14
Figure 17. Compliance status of PM10 at Damak with NAAQS.....	14
Figure 18. Histogram of TSP at Damak station in 2019.....	15
Figure 19. Daily average Total suspended Particulate at Damak station in 2019	15
Figure 20. Monthly average total suspended particulate at Damak station on 2019	16
Figure 21. Boxplot of monthly variation of TSP at Damak station in 2019	16
Figure 22. Boxplot of diurnal variation of TSP at Damak in 2019.....	17
Figure 23. Compliance status of PM10 at Damak with NAAQS	17
Figure 24. Annual average PM1, PM2.5, PM10 and TSP at Damak station for 2020	18
Figure 25. Histogram of PM1 at Damak in 2020.....	18
Figure 26. Daily average PM1 at Damak station in 2020	19
Figure 27. Monthly average PM1 at Damak station in 2020	19
Figure 28. Monthly variation of daily average PM1 at Damak station in 2020	20
Figure 29. Ambient concentration of average PM1 with four seasons	20
Figure 30. Boxplot of diurnal variation of PM1 at Damak station in 2020.....	21
Figure 31. Histogram of PM2.5 at Damak in 2020	22
Figure 32. Daily average PM2.5 at Damak station in 2020	22
Figure 33. Monthly average of PM2.5 at Damak in 2020	23
Figure 34. Monthly variation of daily average PM2.5 at Damak in 2020	23
Figure 35. Seasonal variation of PM2.5 at Damak station on 2020	24
Figure 36. Boxplot of diurnal variation of PM2.5 at Damak in 2020.....	24
Figure 37. Compliance with National Ambient air quality standard for PM2.5 at Damak station in 2020	25
Figure 38. Histogram of PM10 at Damak in 2020.....	26
Figure 39. Daily average PM10 at Damak station in 2020	26
Figure 40. Monthly average PM10 at Damak station in 2020.....	27
Figure 41. . Boxplot of monthly variation of PM10 at Damak in 2020	27

Figure 42. Seasonal average of PM10 at Damak station on 2020.....	28
Figure 43. Diurnal variation of PM10 at Damak in 2020.....	28
Figure 44. Compliance with National Ambient air quality standard for PM10 at Damak station in 2020	29
Figure 45. Histogram of TSP at Damak station in 2020.....	30
Figure 46. Daily average total suspended particulate at Damak in 2020	30
Figure 47. Monthly average of TSP at Damak station in 2020.....	31
Figure 48. Monthly variation of daily average Total suspended particulate at Damak in 2020.....	31
Figure 49. Seasonal average of TSP at Damak station on 2020.....	32
Figure 50. Diurnal variation of TSP at Damak station on 2017.....	32
Figure 51. Compliance with National Ambient air quality standard for TSP at Damak station in 2020	33

1. Damak Air Quality Monitoring Station

About the Station

- Address : Damak Jhapa
- Location: 87.70 longitude, 26.67 latitude
- Establish year: 2019
- Brief introduction of the instruments installed in the station (should include- brief specification; number of instrument)
 1. PM instrument- GRIMM EDM 180
 2. Met sensor luffth WS 700
 3. Data logging and data transmission and power backup system

2. Air Quality Status of Damak station (2019-2020)

2.1 Air Quality status, 2019

2.1.1 Temporal variation of PM1

Annual Average of PM1

Histogram of hourly average PM1 at Damak station in 2019 is shown in following figure

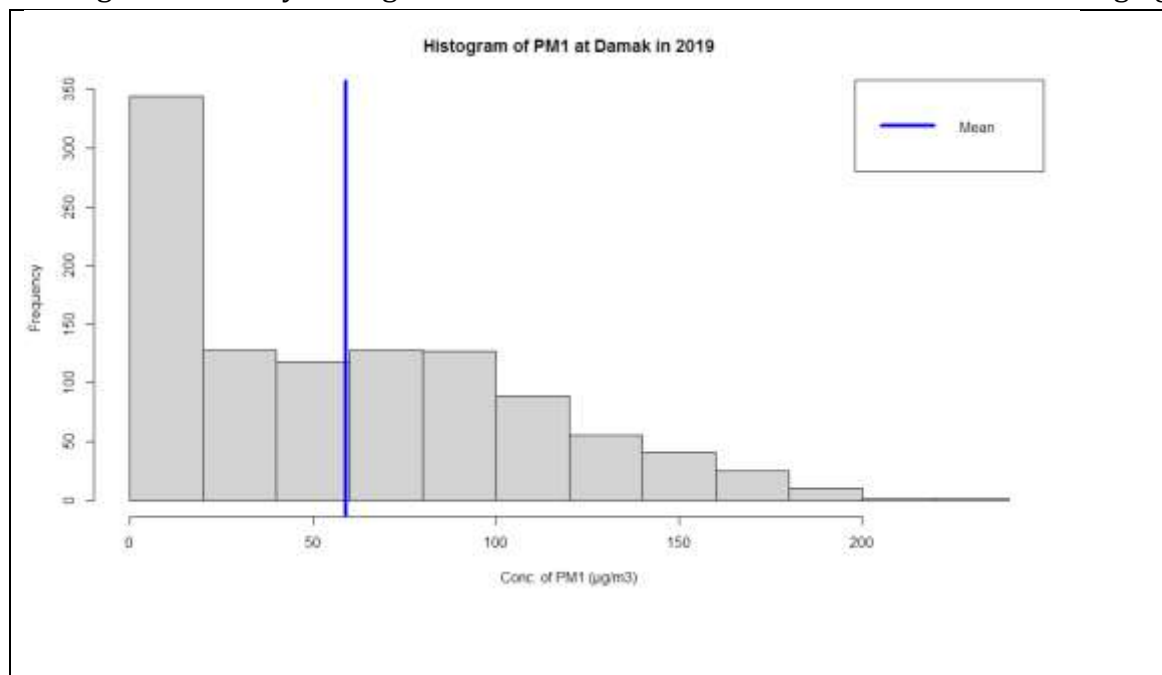


Figure 1. Histogram of PM1 at Damak station in 2019

2.2.3 Daily average of PM1

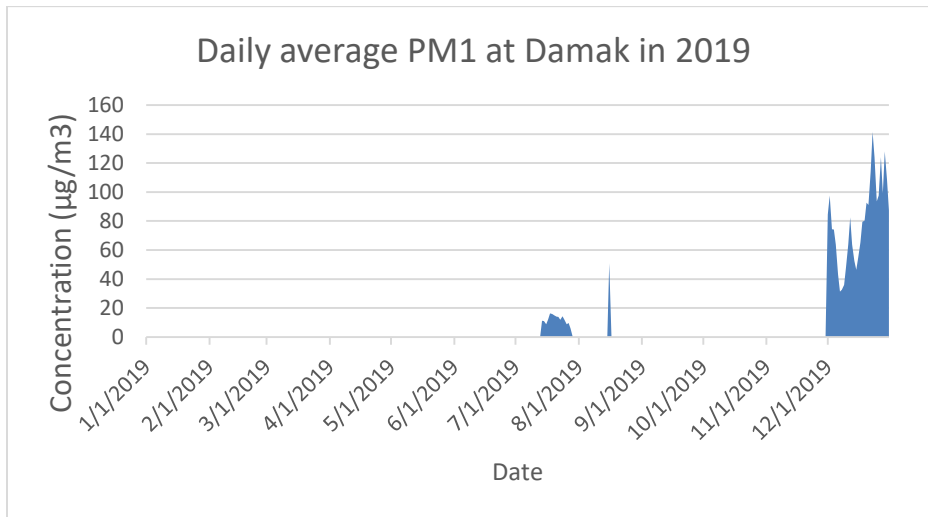


Figure 2. Daily average PM1 at Damak station in 2019

Monthly Average of PM1

Following figure shows monthly average PM1 at Damak station in 2019

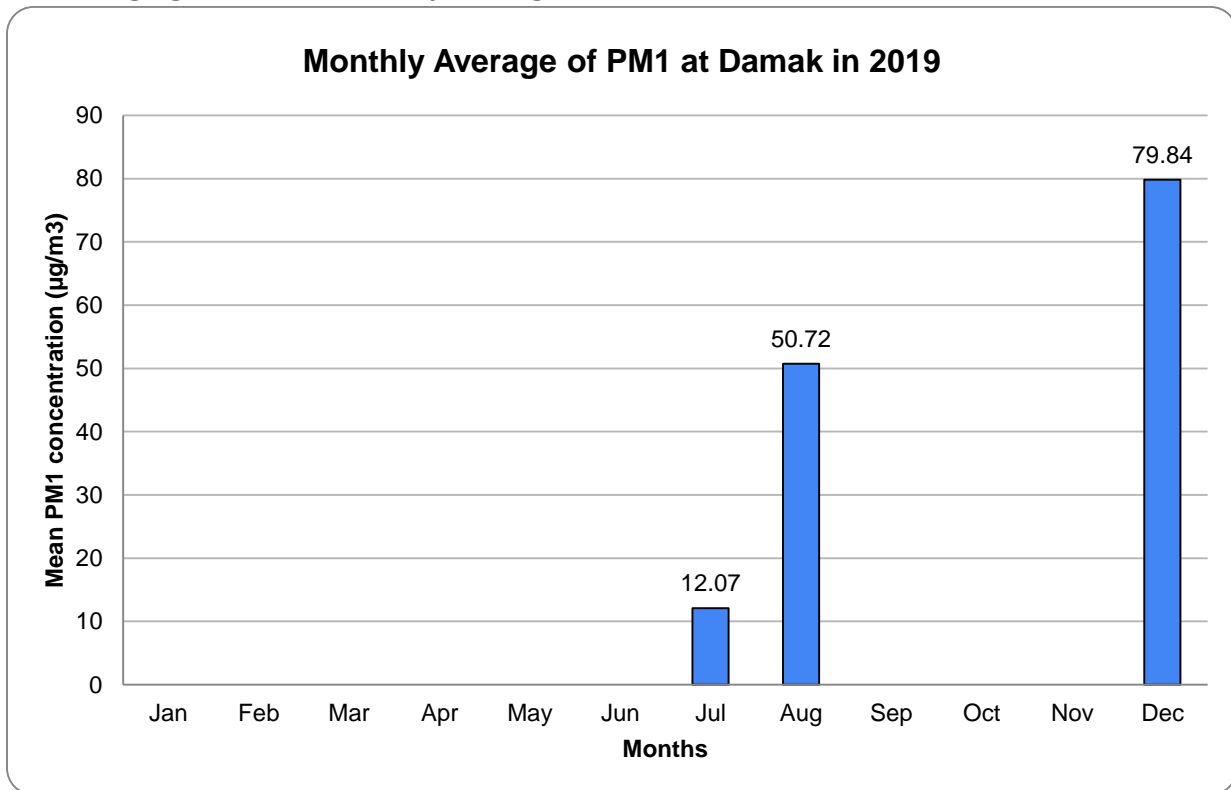


Figure 3. Monthly Average of PM1 at Damak Station in 2019

Only July August and December had the measurement in 2019 at Damak station. Among those three months December had the highest PM1 concentration with monthly average of $79.84 \mu\text{g}/\text{m}^3$.

Monthly variation of PM1

The following figure shows the monthly variation of PM1 at Damak station in 2019.

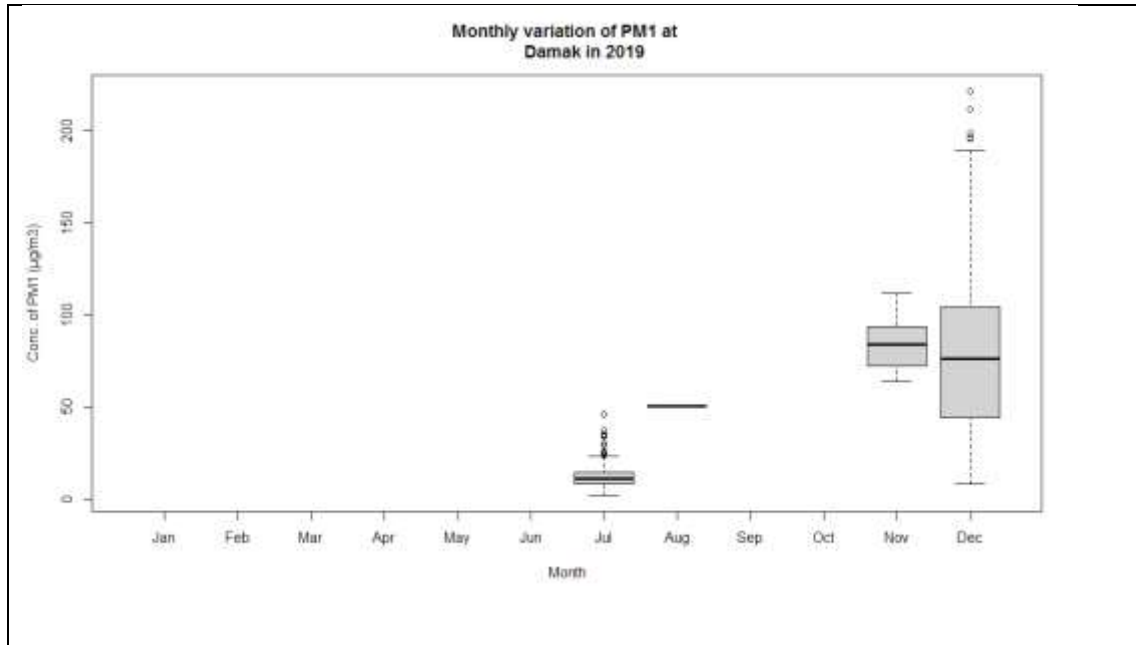


Figure 4. Boxplot of monthly variation of PM1 at Damak station in 2019

Variation in concentration of PM₁ was found more in December.

Diurnal Variation of PM1

The following figure shows the diurnal variation of PM1 at Damak station in 2019.

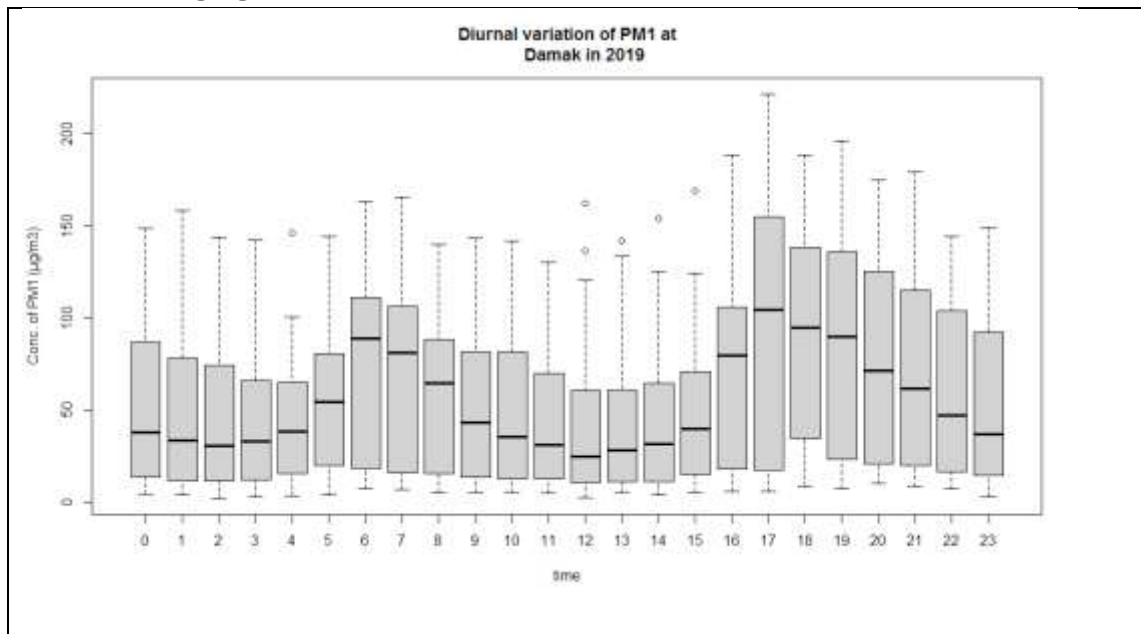


Figure 5. Boxplot of diurnal variation of PM1 at Damak in 2019

The boxplot shows that PM₁ concentration is more in 6 O'clock in the morning and 17 o'clock in the evening similarly it is also more variable during this time.

2.1.2 Temporal variation of PM2.5

Annual Average of PM2.5

The following figure shows the histogram of PM2.5 at Damak station in 2019.

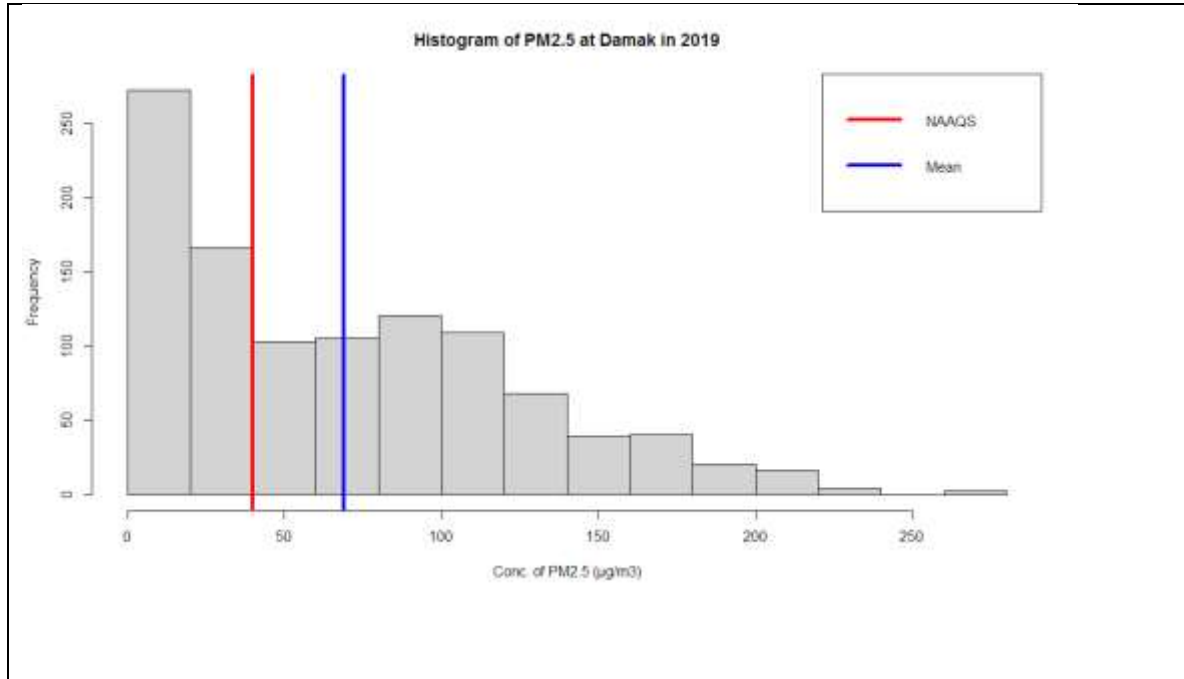


Figure 6. Histogram of PM2.5 at Damak station in 2020

The Histogram of PM2.5 at Damak station in 2019 shows that highest no of hourly data are between 0 - 20 µg/m³.

Daily average of PM 2.5

Following figure shows the daily average PM2.5 bar graph at Damak station in 2019.

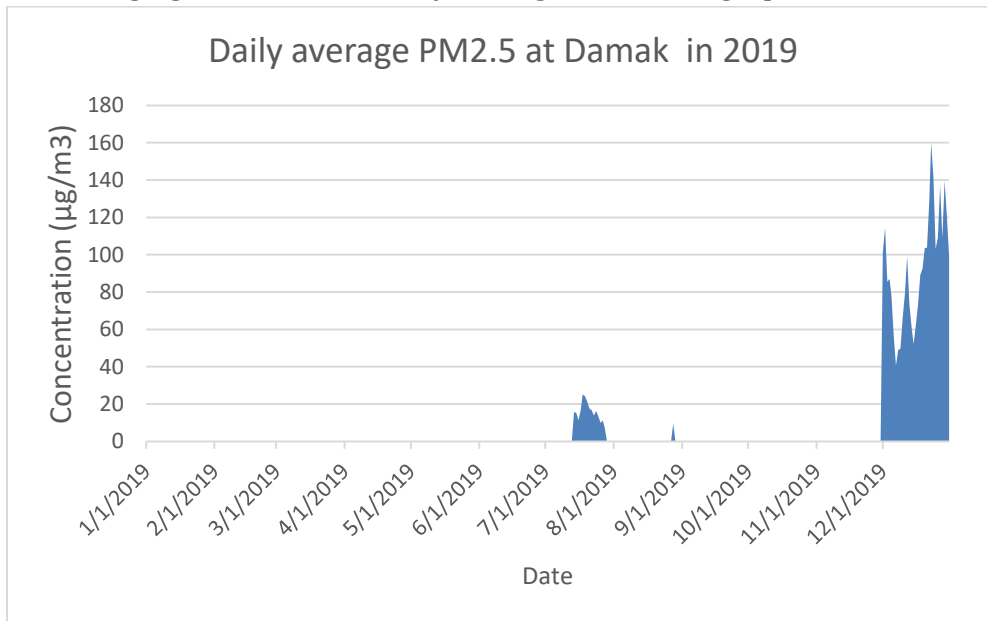


Figure 7. Daily average PM 2.5 at Damak station in 2019

Monthly average of PM2.5

Figure 2 shows the monthly average PM_{2.5}.

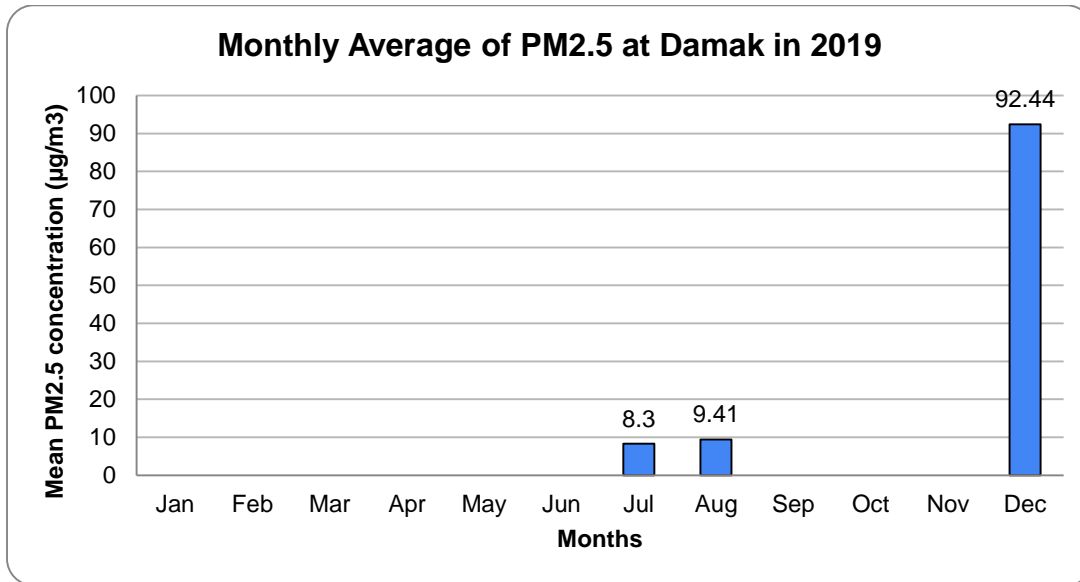


Figure 8. Monthly average PM_{2.5} at Damak station in 2019

Only July August and December had the measurement in 2019 at Damak station. Among those three months December had the highest PM₁ concentration with monthly average of 92.44 µg/m³.

Monthly variation of PM2.5

Following figure shows the monthly variation of PM_{2.5} at Damak station in 2019.

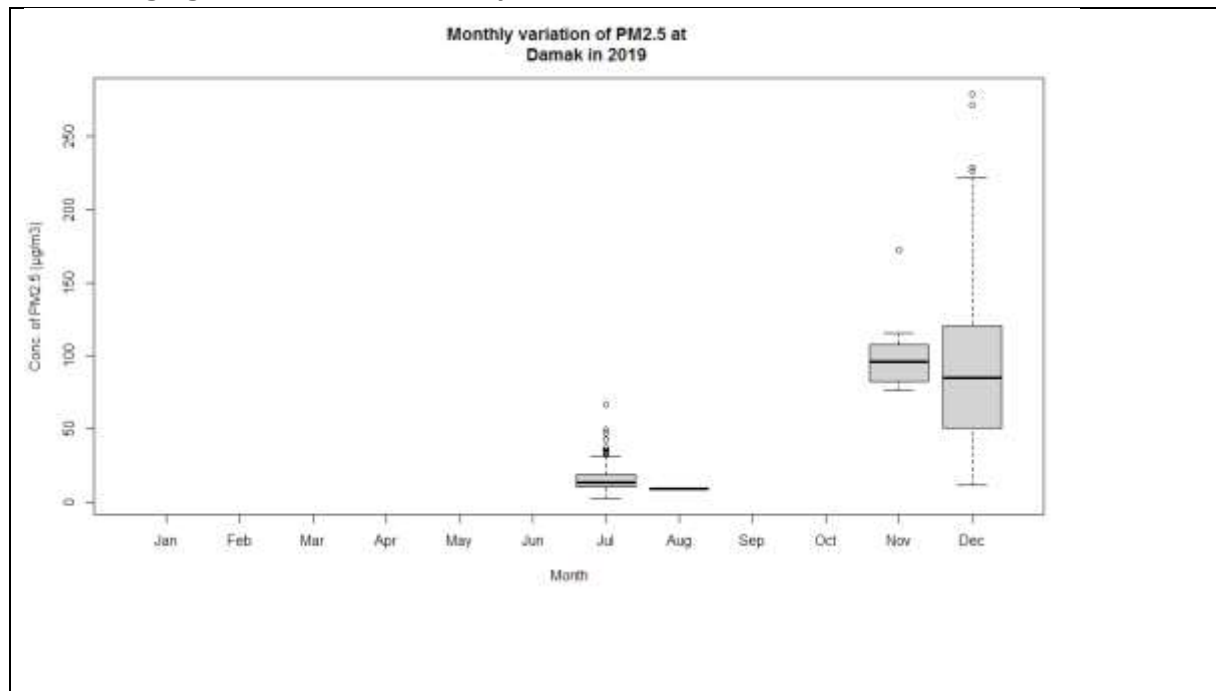


Figure 9. Boxplot of Monthly variation of PM_{2.5} at Damak station in 2019

The Boxplot shows there was more variation of Hourly average PM₁ data in December.

Diurnal Variation of PM2.5

The following figure shows the diurnal variation of PM2.5 at Damak station in 2019.

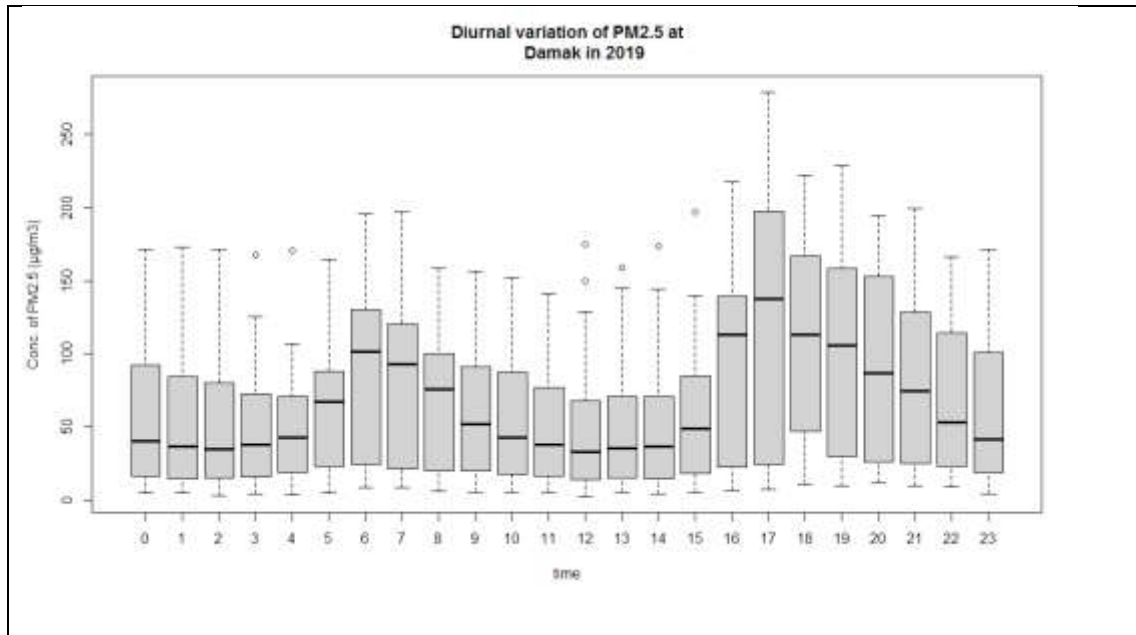


Figure 10. Boxplot of PM2.5 at Damak station in 2019

The Boxplot of diurnal variation of PM 2.5 shows PM2.5 concentrations was highest at 6 o'clock in the morning and 17 o'clock in the evening similarly highest variation was also at those time.

Compliance with National Ambient Air Quality Standards(NAAQS)

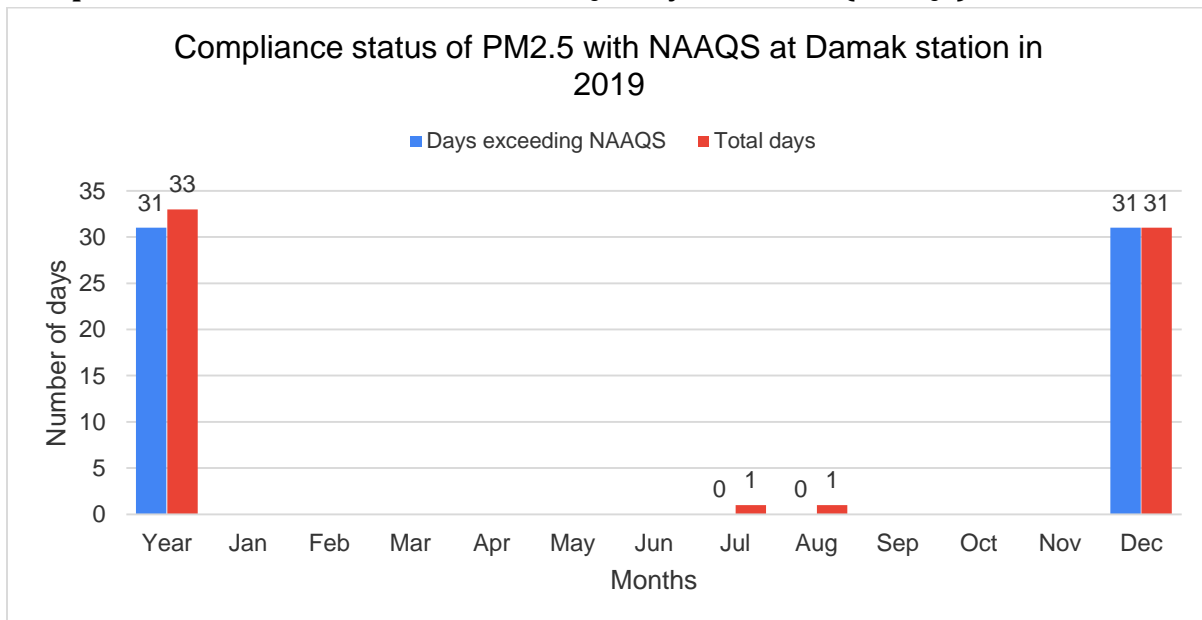


Figure 11. Compliance status of PM2.5 at Damak with NAAQS

In 2019 out of 68 days of measurement 43 days exceeded the national ambient air quality standard for PM2.5.

2.1.3 Temporal variation of PM10

Annual average of PM10.

Following figure shows the Histogram of PM10 at Damak station in 2019.

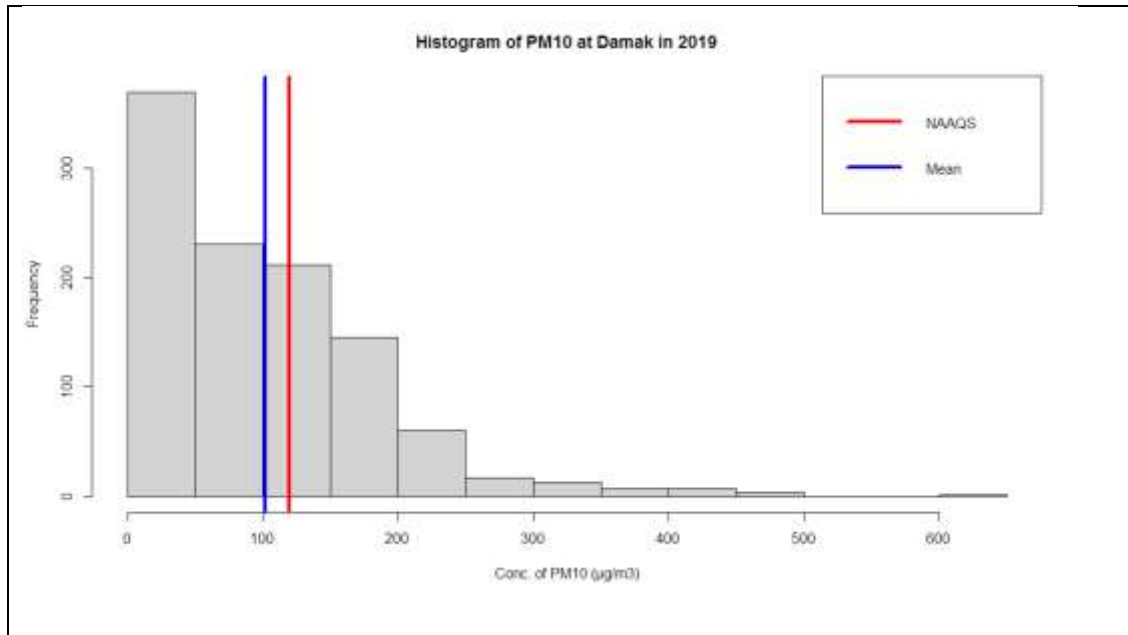


Figure 12. Histogram of PM10 at Damak station in 2019

The Histogram of PM10 at Damak station in 2019 shows that highest no of hourly data is between 0 - 50 $\mu\text{g}/\text{m}^3$ concentration followed by 50-100 $\mu\text{g}/\text{m}^3$ concentration.

Daily average of PM10

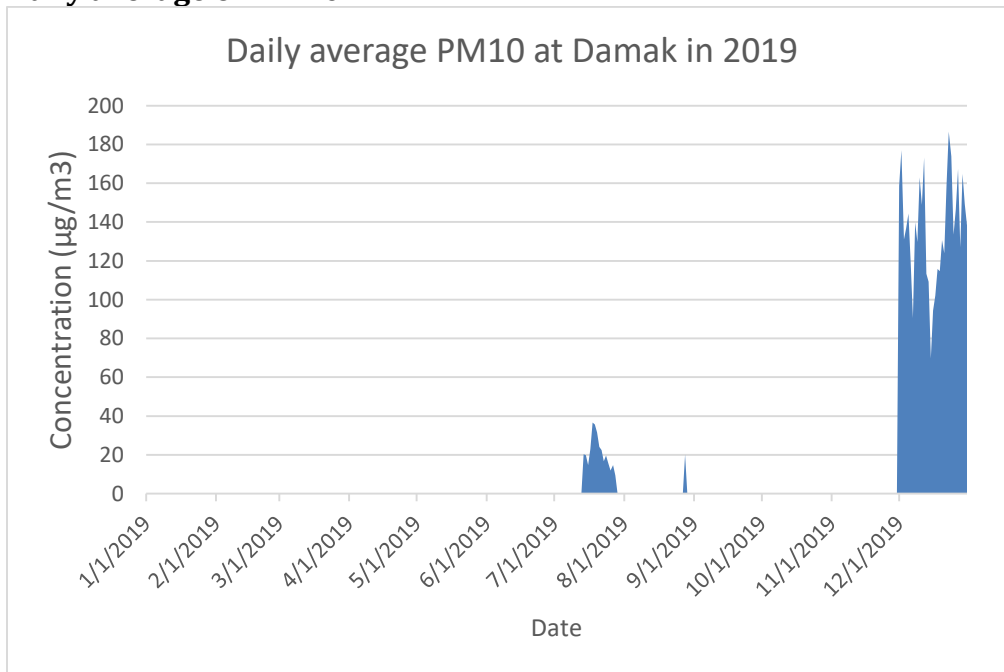


Figure 13. Daily average PM10 at Damak station in 2019

Monthly Average of PM10

Figure 8 shows the monthly average of PM10 at Damak in 2019.

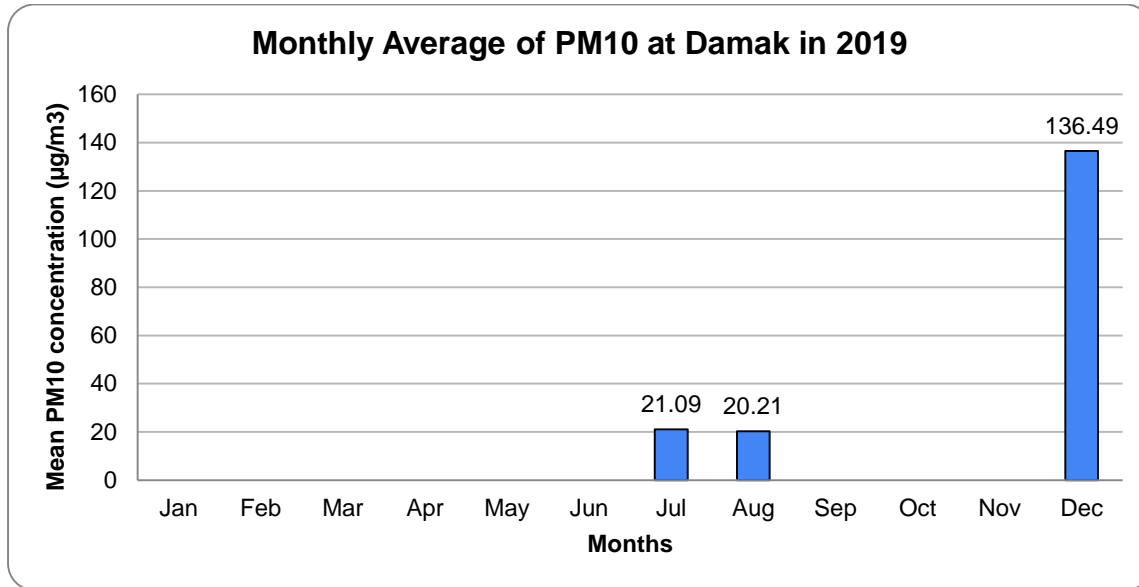


Figure 14. Monthly average PM10 at Damak station in 2019

Only July August and December had the measurement in 2019 at Damak station. Among those three months December had the highest PM10 concentration with monthly average of 136.49 µg/m³.

Monthly Variation of PM10

Following figure shows the monthly variation of PM10 at Damak station in 2019.

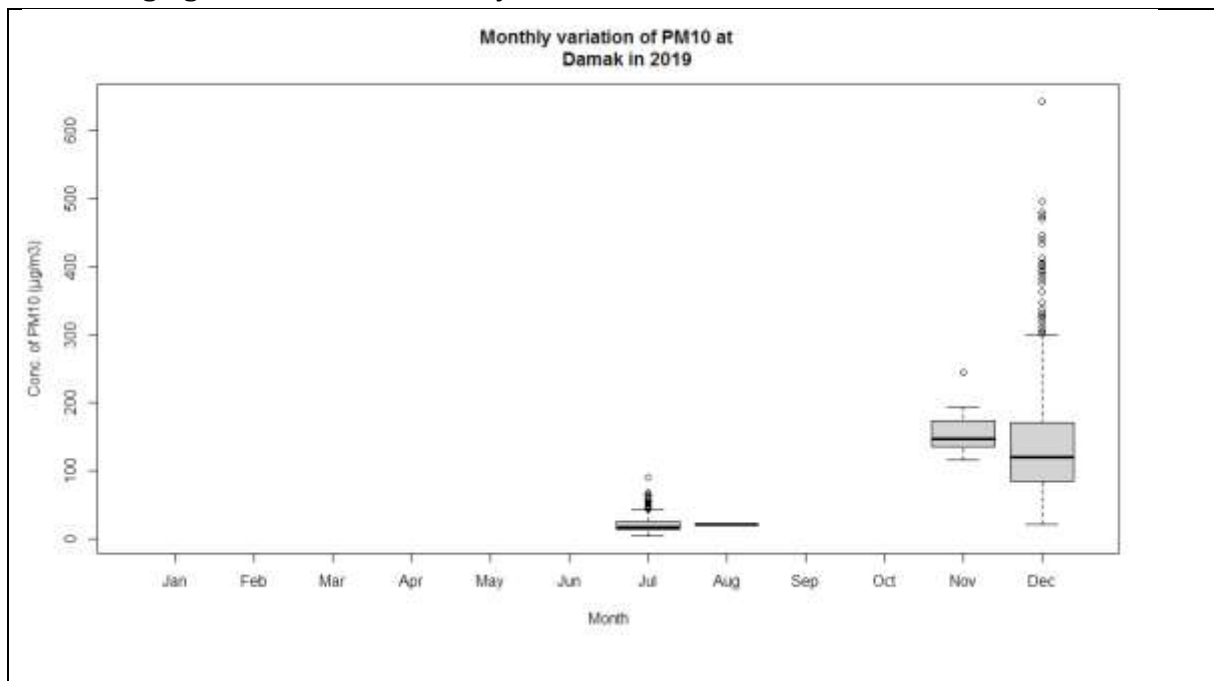


Figure 15. Boxplot of monthly variation of PM10 at Damak in 2019

The Boxplot of monthly variation of PM10 at Damak shows that hourly average of PM10 is more variable during December.

Diurnal Variation of PM10

Following figure shows the diurnal variation of PM10 at Damak station in 2019.

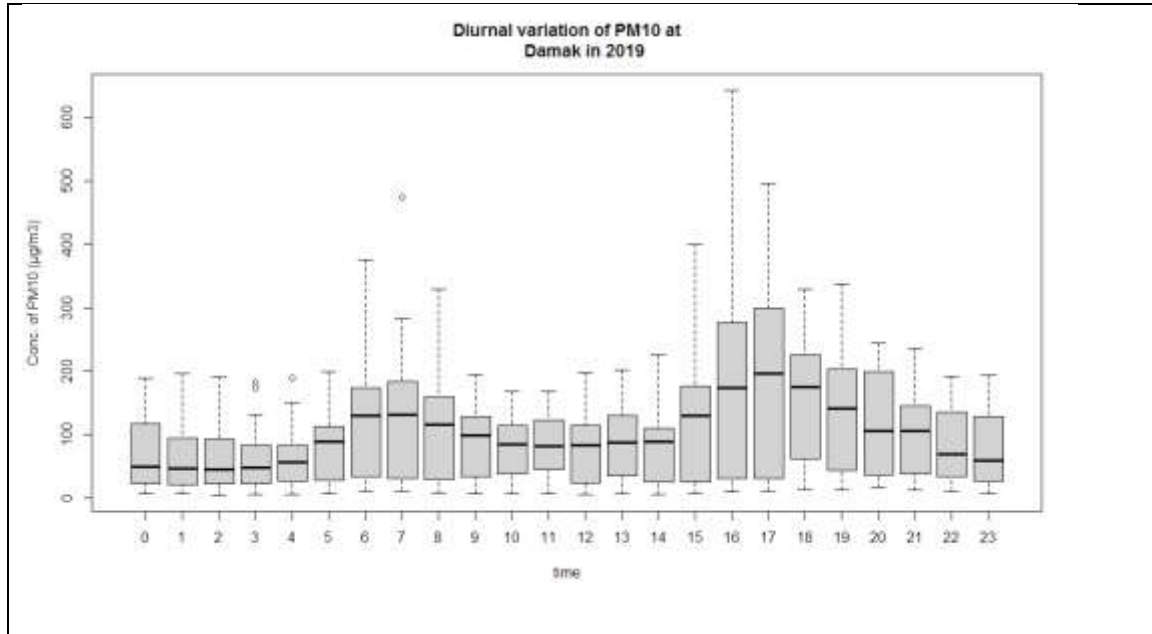


Figure 16. Boxplot of diurnal variation of PM10 at Damak in 2019

The boxplot of diurnal variation of PM10 at Damak station in 2019 shows that concentration of PM10 was highest during 6 and 7 O'clock in the morning and 17 at the evening similarly variation was highest during those periods.

Compliance with National ambient air quality standard

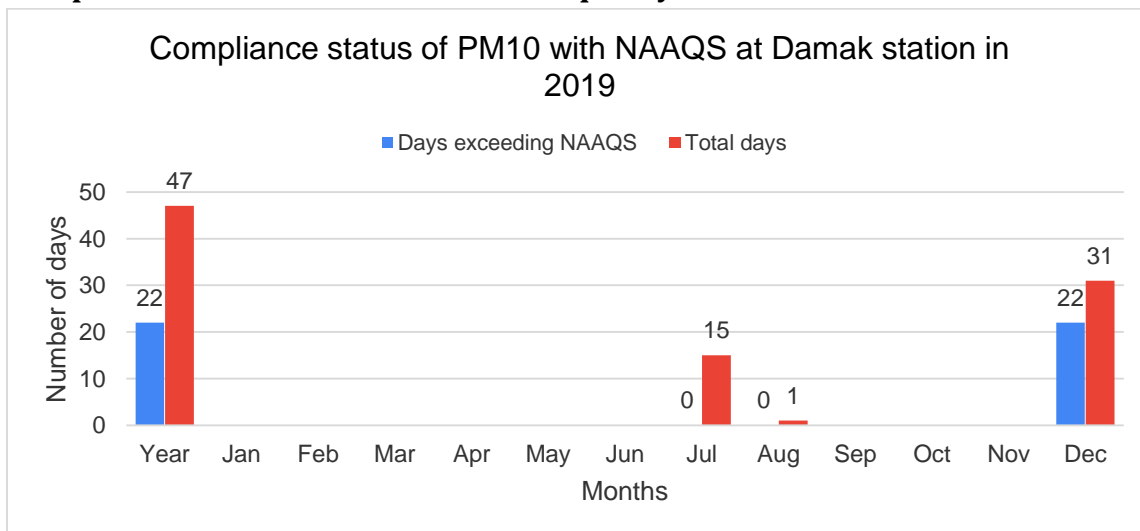


Figure 17. Compliance status of PM10 at Damak with NAAQS

Out of total 47 days of Measurement 22 days exceed the National ambient air quality standard for PM10.

2.1.4 Temporal variation of TSP

Annual Average of TSP

Following figure shows the Histogram of Total suspended Particulate(TSP) at Damak station in 2019.

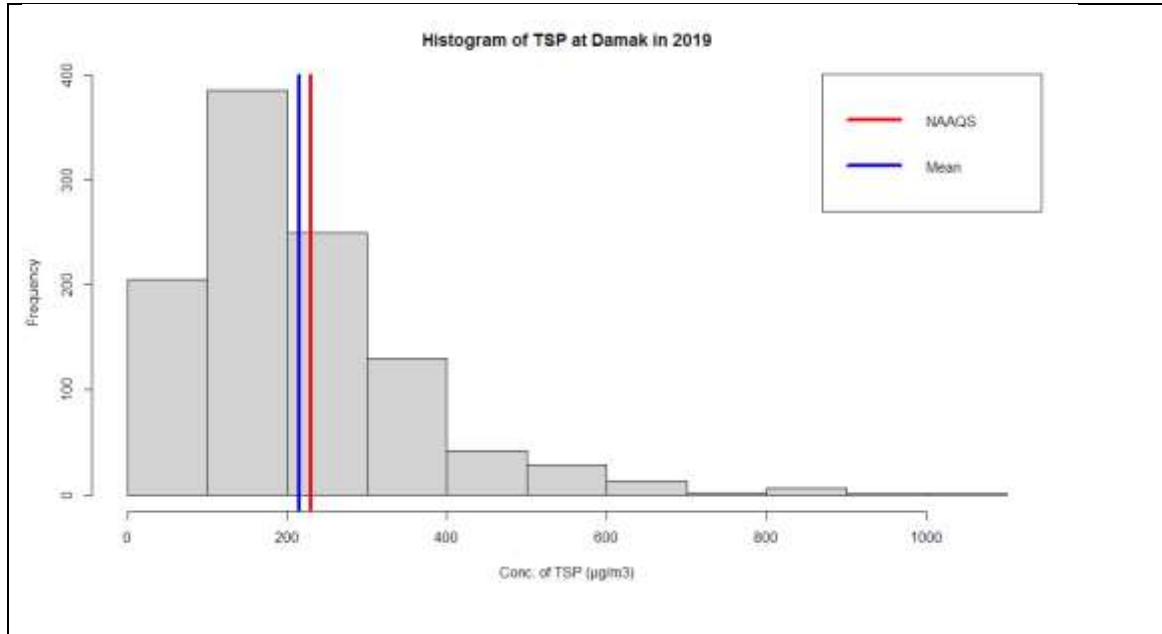


Figure 18. Histogram of TSP at Damak station in 2019

The Histogram of TSP at Damak station in 2019 shows that highest no of hourly data is between 100 - 200 $\mu\text{g}/\text{m}^3$ concentration followed by 200-300 $\mu\text{g}/\text{m}^3$ concentration.

Daily average of TSP

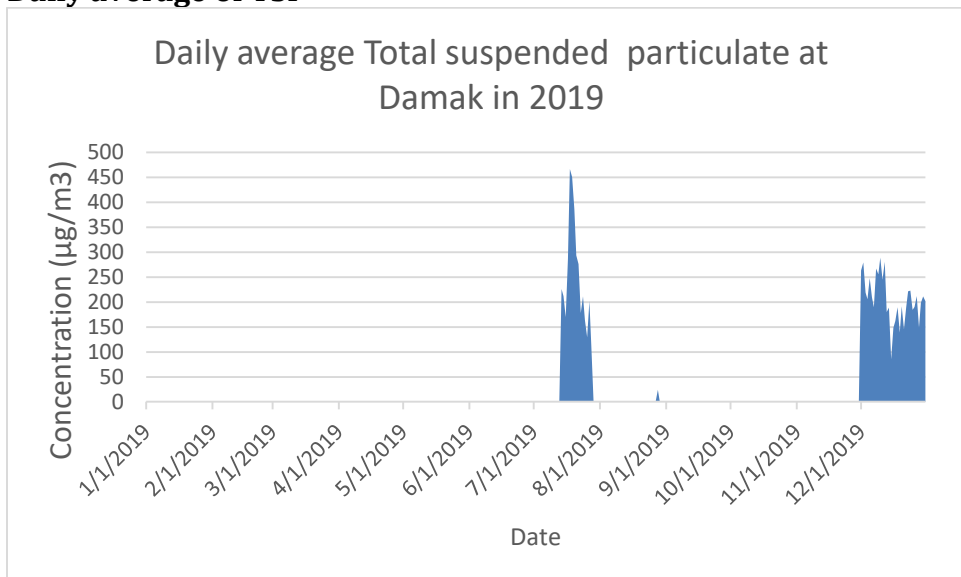


Figure 19. Daily average Total suspended Particulate at Damak station in 2019

Monthly Average of TSP

Following figure shows the monthly average of Total suspended particulate at Damak station in 2019.

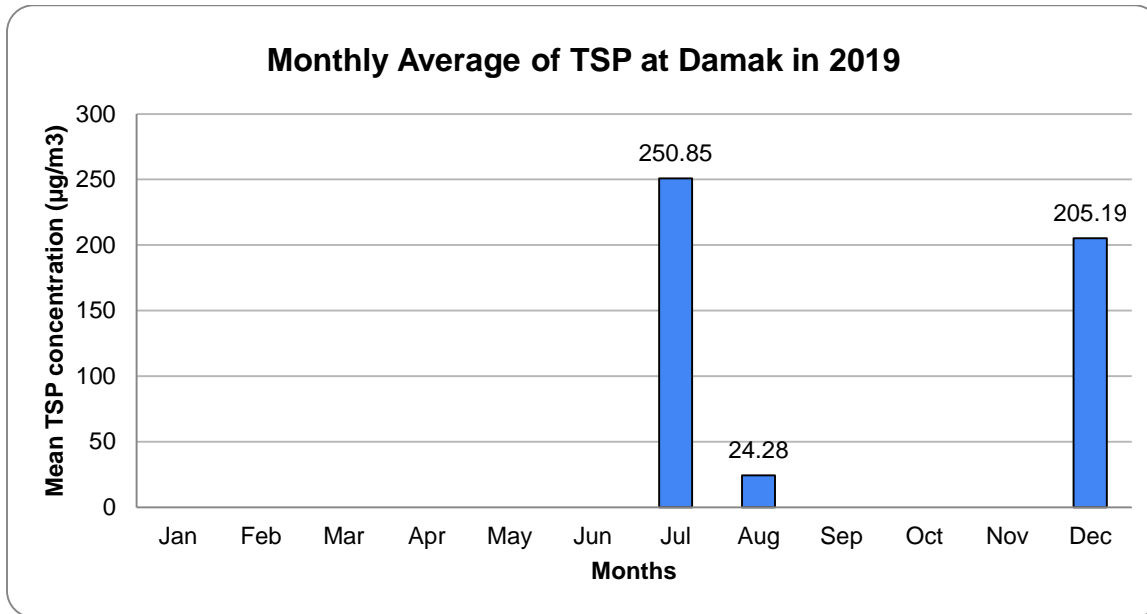


Figure 20. Monthly average total suspended particulate at Damak station on 2019

Only July August and December had the measurement in 2019 at Damak station. Among those three stations July had the highest TSP concentration with monthly average of 250.85 µg/m³.

Monthly variation of TSP

Following figure shows the monthly variation of Total suspended particulate

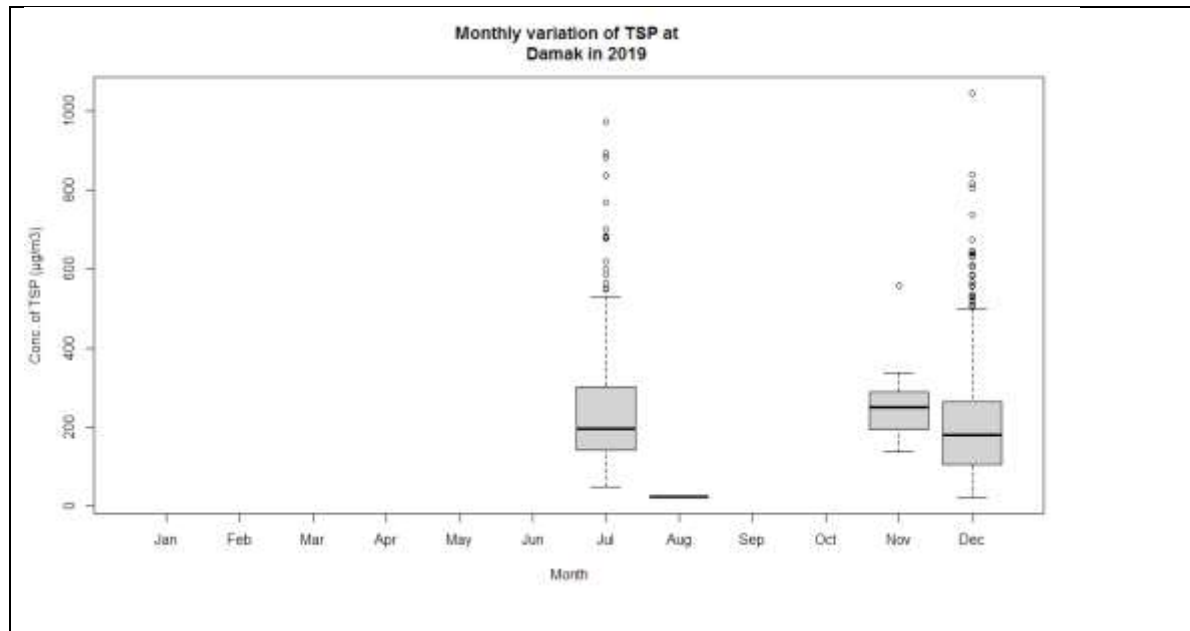


Figure 21. Boxplot of monthly variation of TSP at Damak station in 2019

The Boxplot of Total suspended particulate at Damak in 2019 shows more variation of TSP in July and December.

Diurnal Variation of TSP

Following figure shows the diurnal variation of Total suspended particulate at Damak station in 2019.

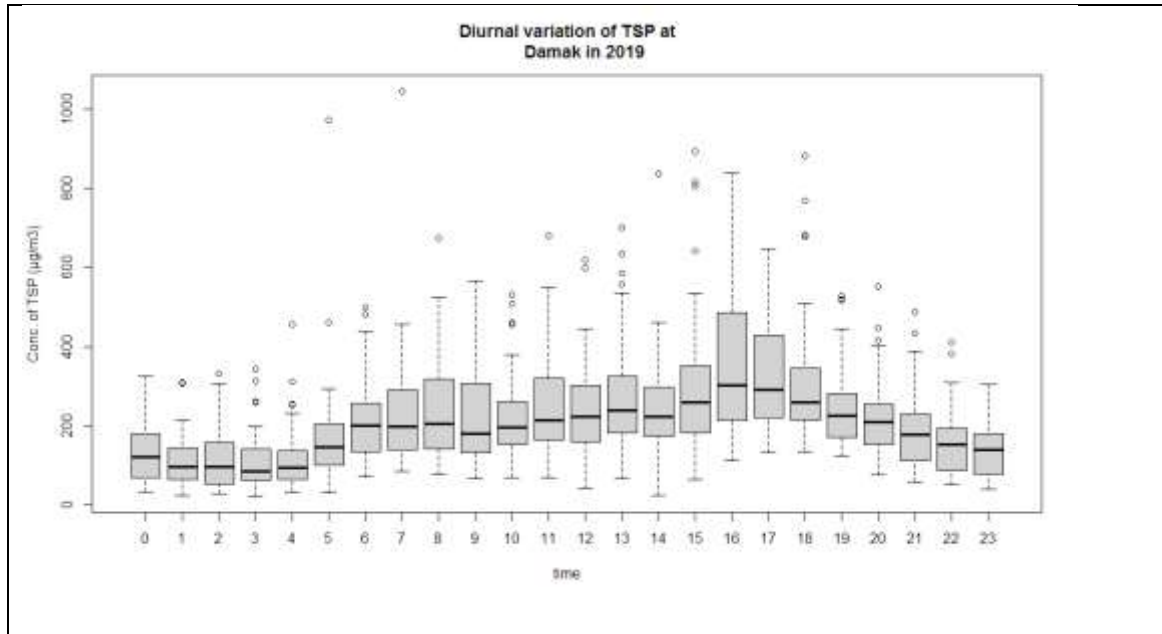


Figure 22. Boxplot of diurnal variation of TSP at Damak in 2019

The Boxplot of TSP at Damak in 2019 shows that the concentration of TSP was more during 16 and 17 O'clock and was more variable during 16 o'clock.

Compliance with National ambient air quality standard.

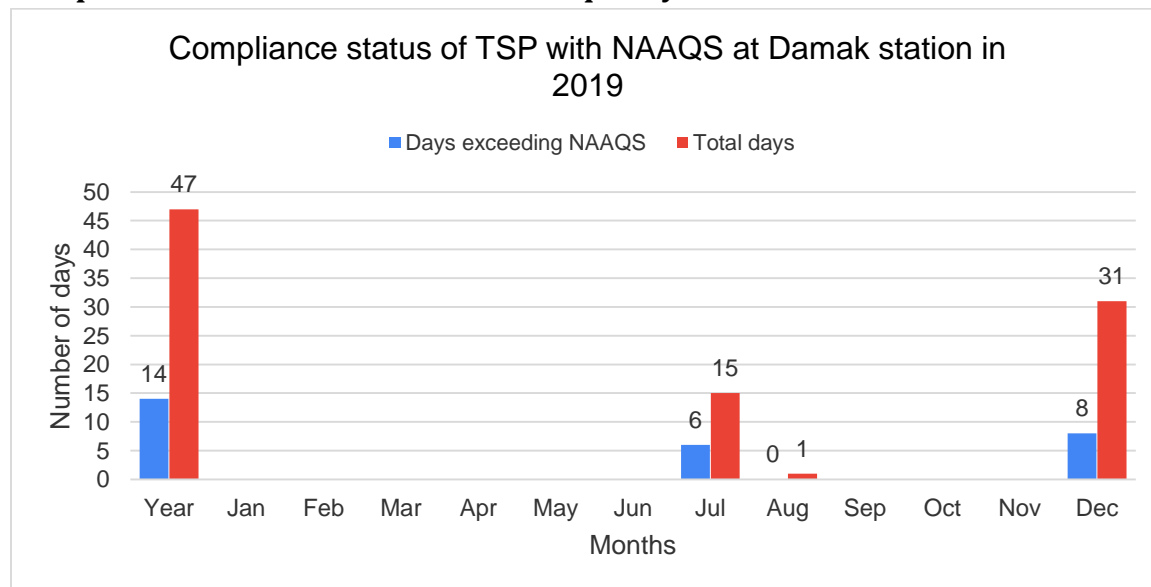


Figure 23. Compliance status of PM10 at Damak with NAAQS

Out of 47 days of measurement in 2019 14 days exceed the National Ambient air quality standard for TSP.

2.2 Air Quality Status, 2020

2.2.1 Annual average of PM1, PM2.5, PM10 and TSP

Annual average of all parameters (PM1, PM2.5, PM10 and TSP for this station)

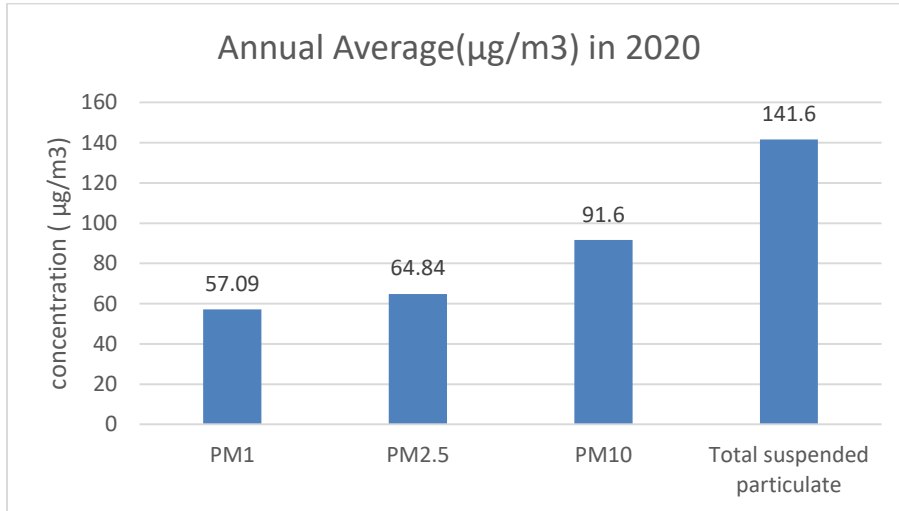


Figure 24. Annual average PM1, PM2.5, PM10 and TSP at Damak station for 2020

2.2.2 Temporal Variation of PM1

Annual Average of PM1

Annual average PM1 at Damak station at 2020 was 57.09 µg/m³. Following figure shows the Histogram of PM1 at Damak in 2020.

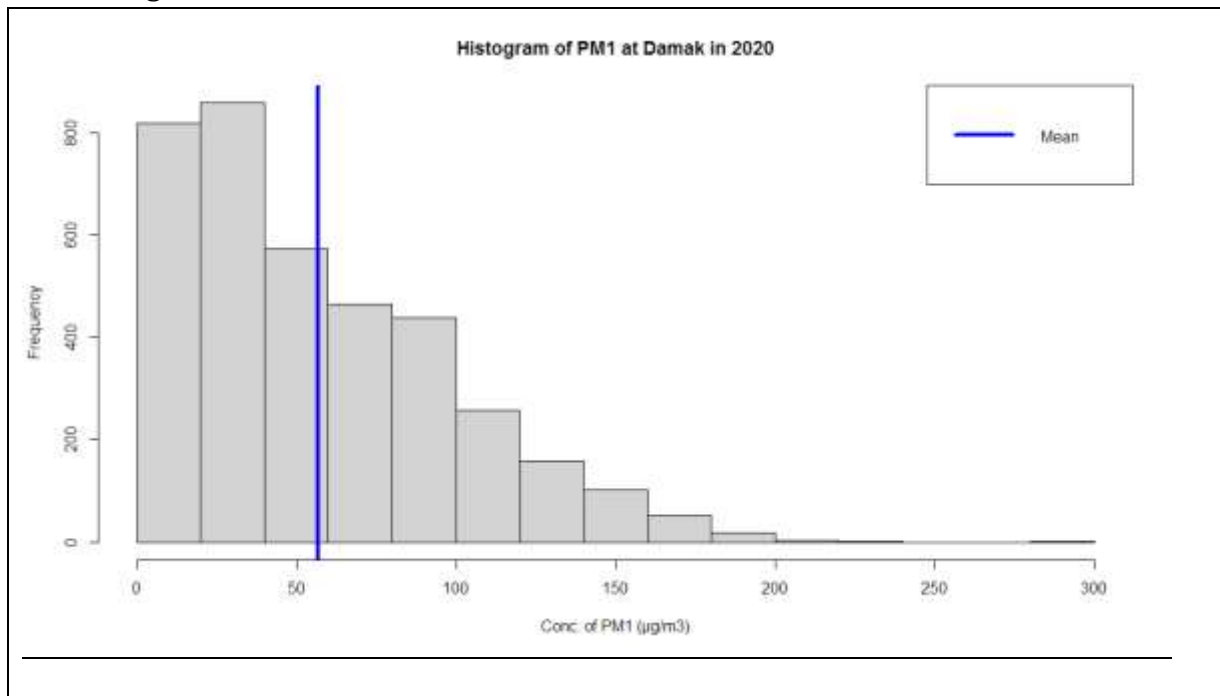


Figure 25. Histogram of PM1 at Damak in 2020

The Histogram shows that highest no of hourly average data were between 20-40 $\mu\text{g}/\text{m}^3$ followed by 0-20 $\mu\text{g}/\text{m}^3$.

Daily average of PM1

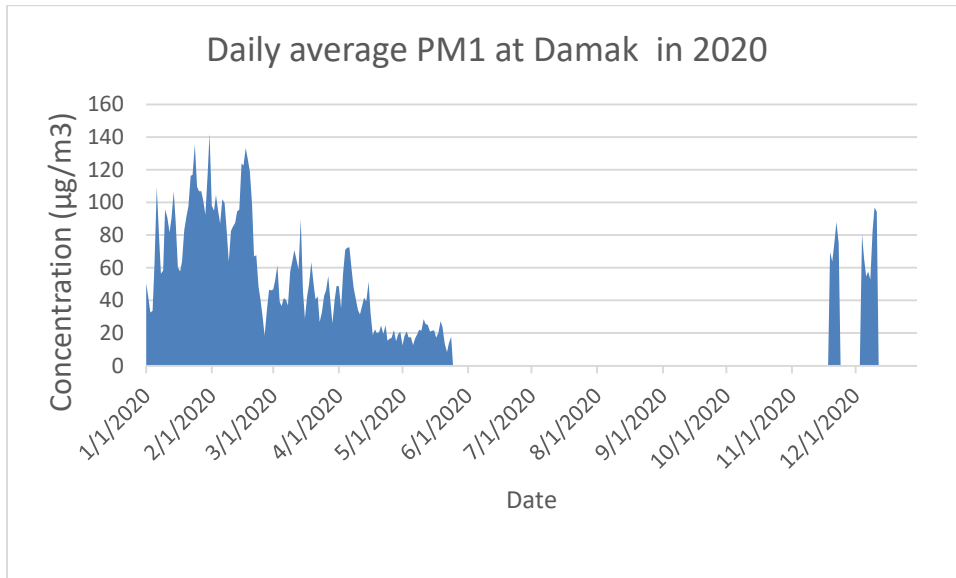


Figure 26. Daily average PM1 at Damak station in 2020

Monthly Average of PM1

Following Figure shows the monthly average of PM₁.

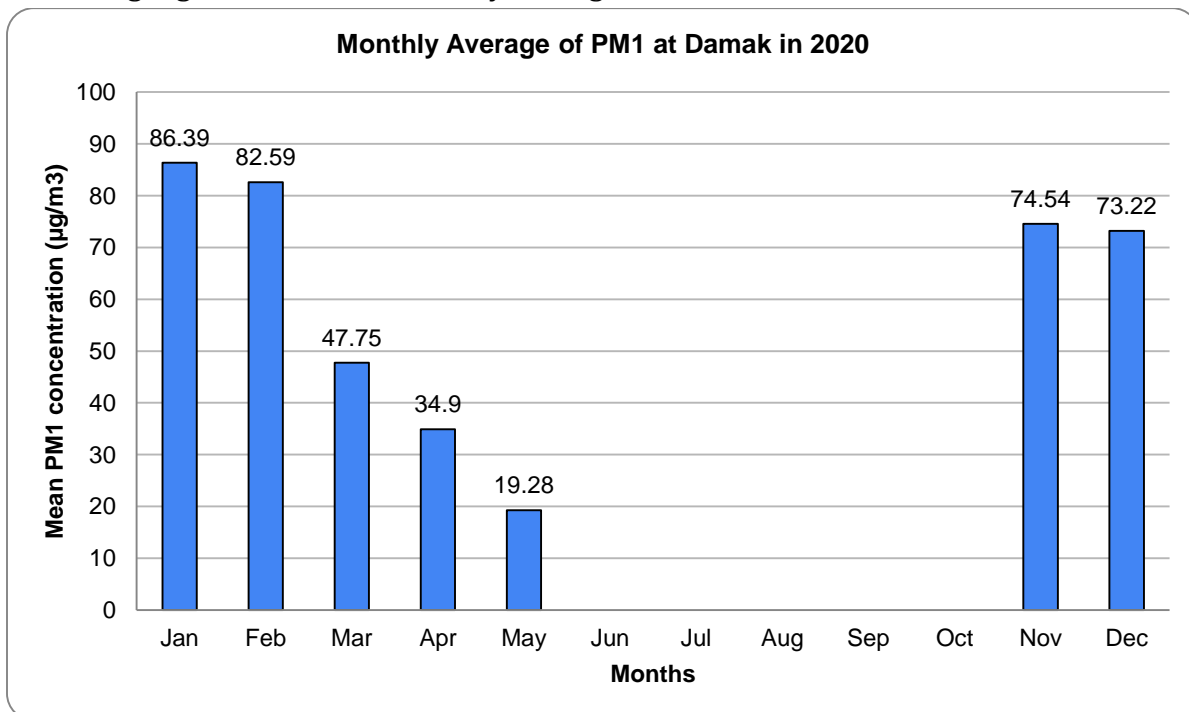


Figure 27. Monthly average PM1 at Damak station in 2020

Above figure shows that the average value of PM₁ was highest in January with monthly average value of 86.39 $\mu\text{g}/\text{m}^3$ and while lowest value were observed in May with average monthly value of 19.28 $\mu\text{g}/\text{m}^3$.

Monthly Variation of PM1

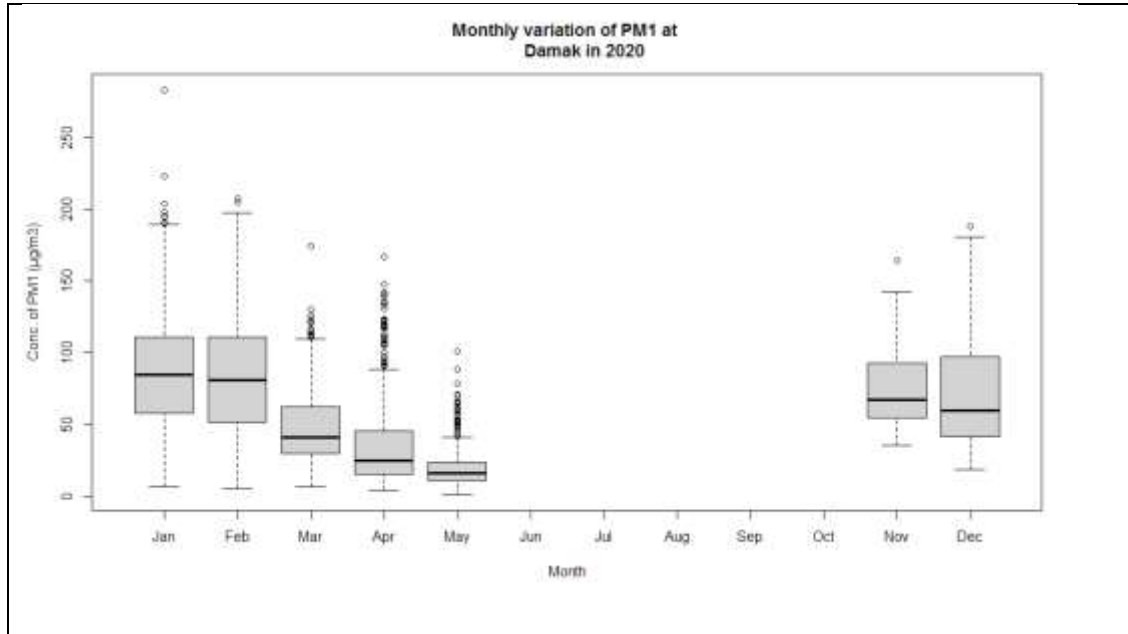


Figure 28. Monthly variation of daily average PM1 at Damak station in 2020

Boxplot of monthly variation of PM1 shows that highest variation was seen on January, February and December.

Seasonal Average of PM1

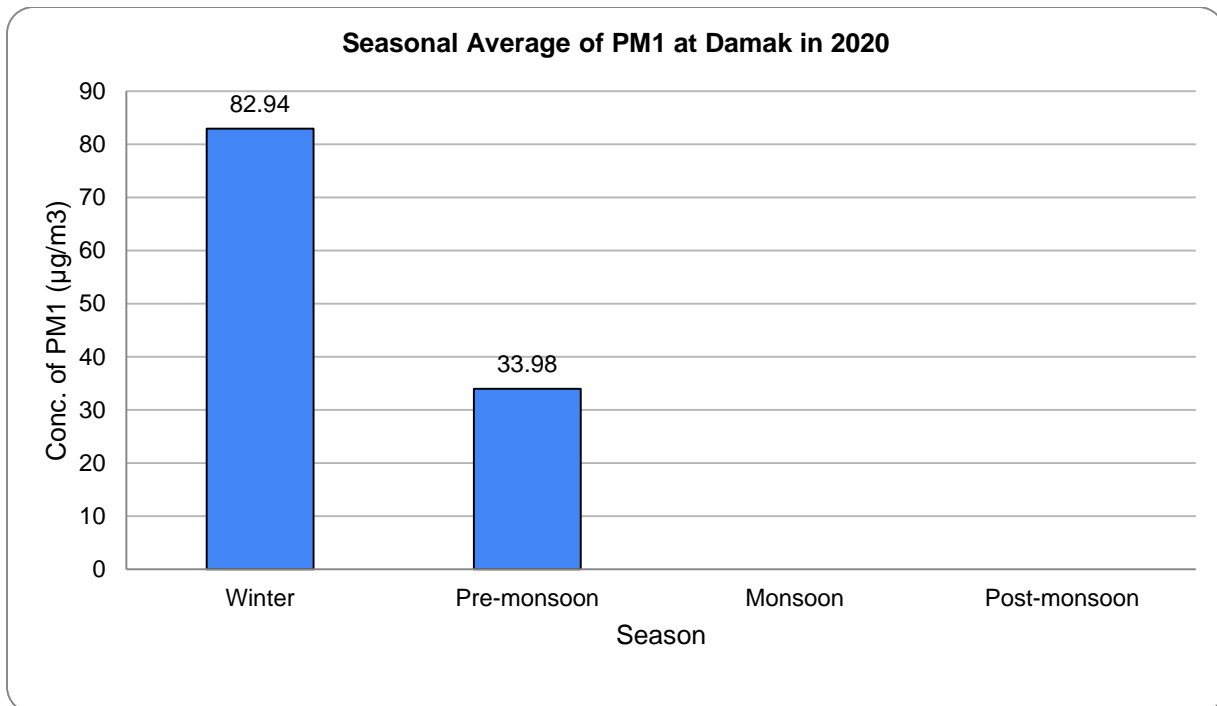


Figure 29. Ambient concentration of average PM1 with four seasons

Diurnal Variation of PM1

Following figure shows the boxplot of diurnal variation of PM1 at Damak station in 2020.

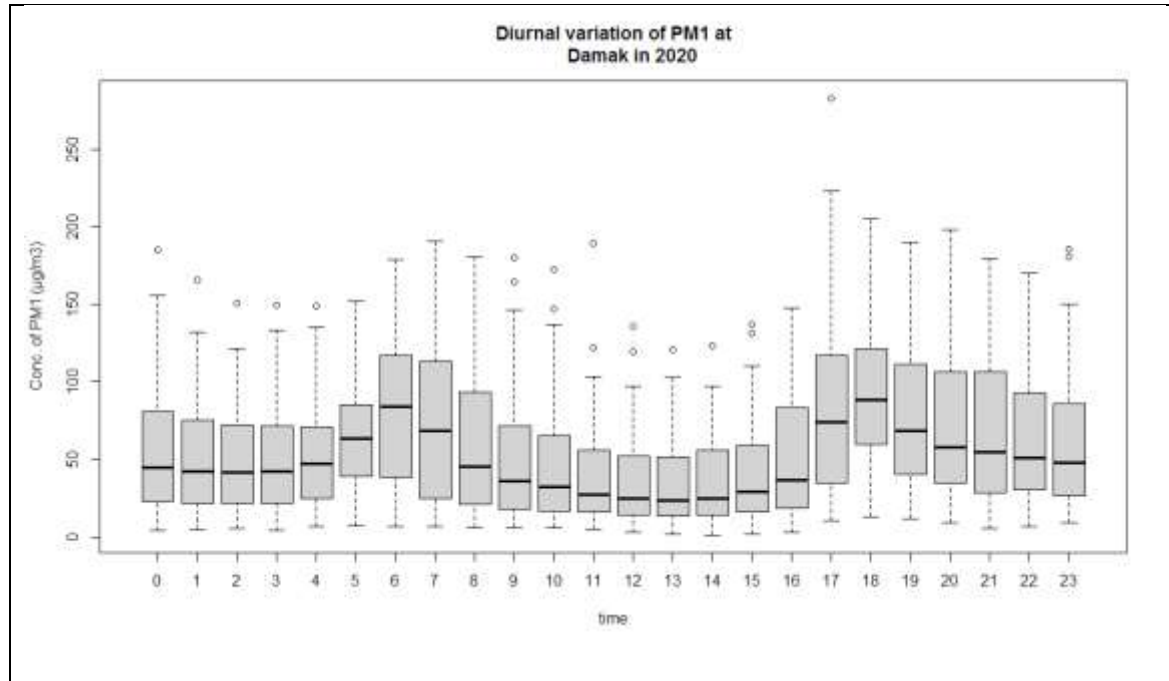


Figure 30. Boxplot of diurnal variation of PM1 at Damak station in 2020

Above figure shows that PM1 concentration was more at 6 o'clock in the morning and 18 o'clock in the evening. It was more variable 7 o'clock in the morning and 17 o'clock in the evening.

2.2.3 Temporal Variation of PM2.5

Annual Average of PM2.5

The annual average of PM2.5 at Damak station on 2020 was $64.84 \mu\text{g}/\text{m}^3$. Following figure shows the Histogram of PM2.5 at Damak station in 2020.

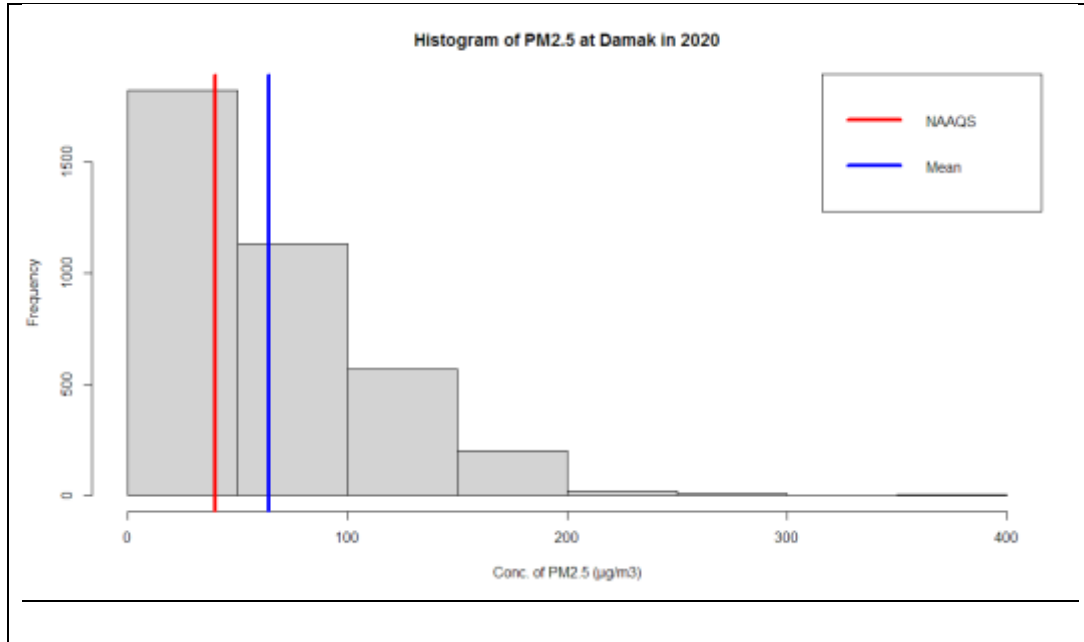


Figure 31. Histogram of PM2.5 at Damak in 2020

The Histogram shows that highest no of hourly average data were between $0\text{-}50\mu\text{g}/\text{m}^3$ followed by $50\text{-}100 \mu\text{g}/\text{m}^3$.

Daily Average of PM2.5

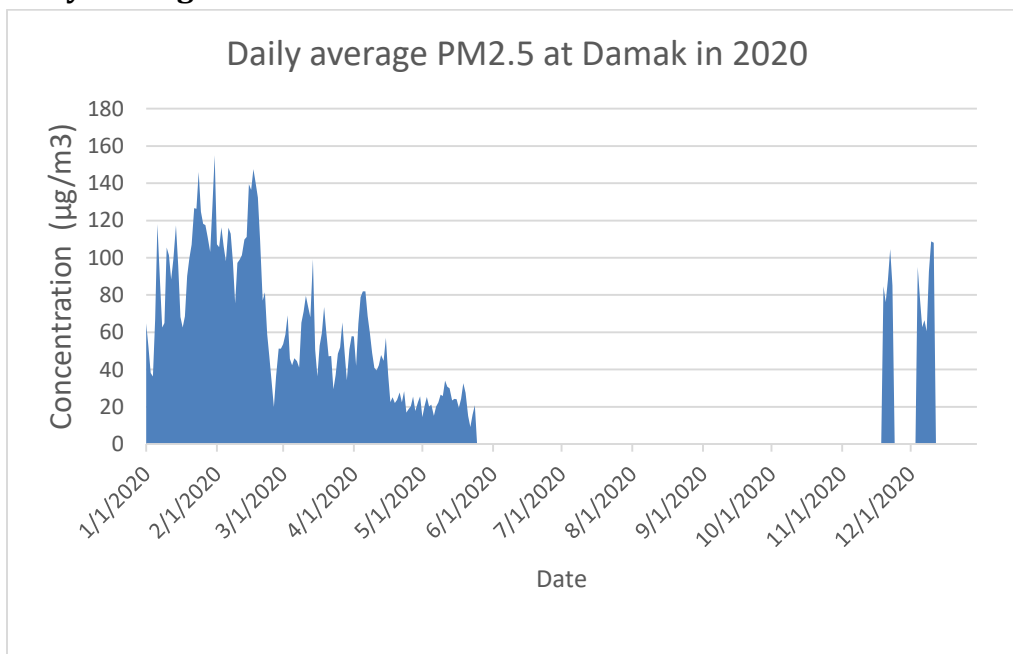


Figure 32. Daily average PM2.5 at Damak station in 2020

Monthly Average of PM2.5

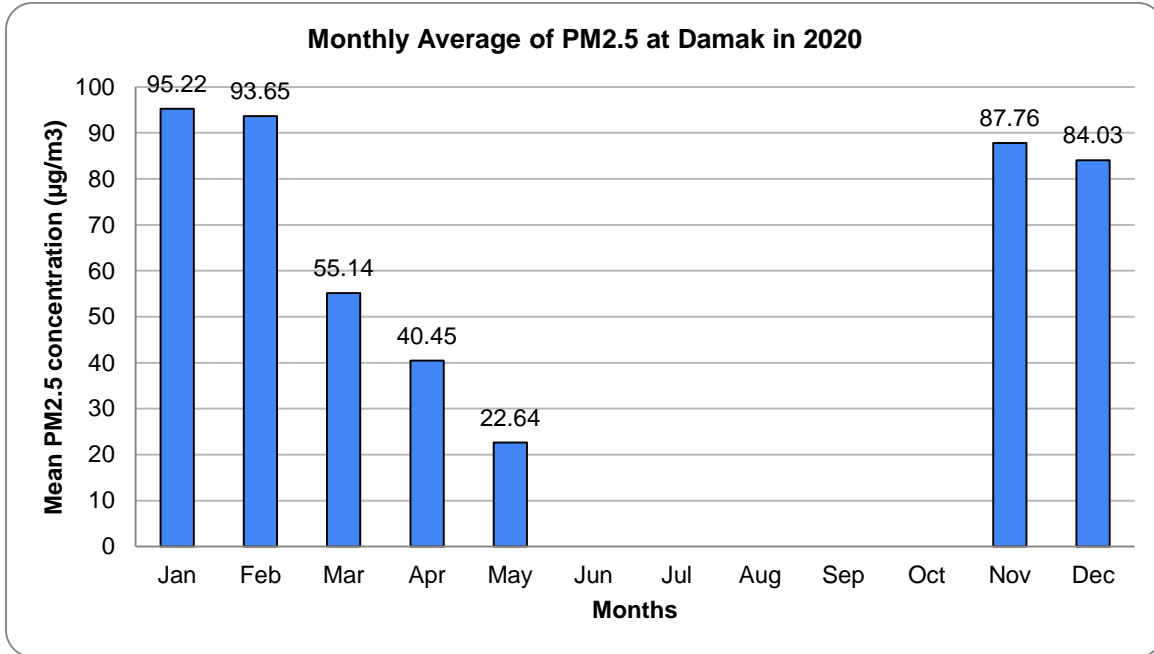


Figure 33. Monthly average of PM2.5 at Damak in 2020

Above figure shows that the monthly average value of PM_{2.5} was highest in January with monthly average value of 95.22µg/m³ while lowest value was observed in May with monthly average value of 22.64 µg/m³

Monthly Variation of PM2.5

Following figure shows the boxplot of monthly variation of PM2.5 at Damak in 2020.

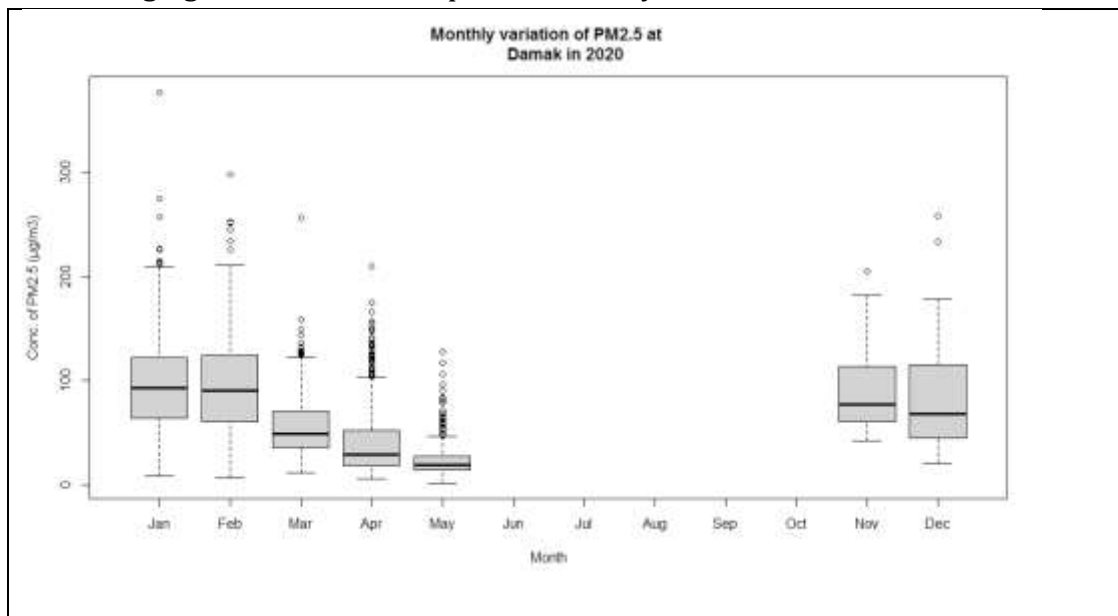


Figure 34. Monthly variation of daily average PM2.5 at Damak in 2020

Above figure shows that hourly average data of PM2.5 was more variable in January, February, November and December.

Seasonal Average of PM2.5

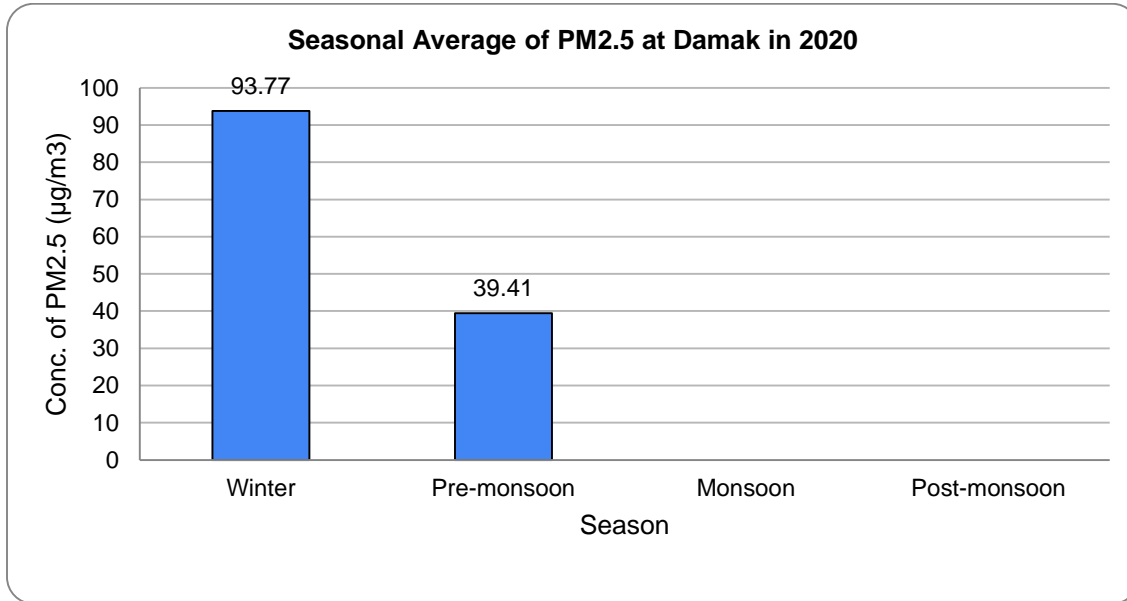


Figure 35. Seasonal variation of PM2.5 at Damak station on 2020

The figure shows highest seasonal average in winter season

Diurnal Variation of PM2.5

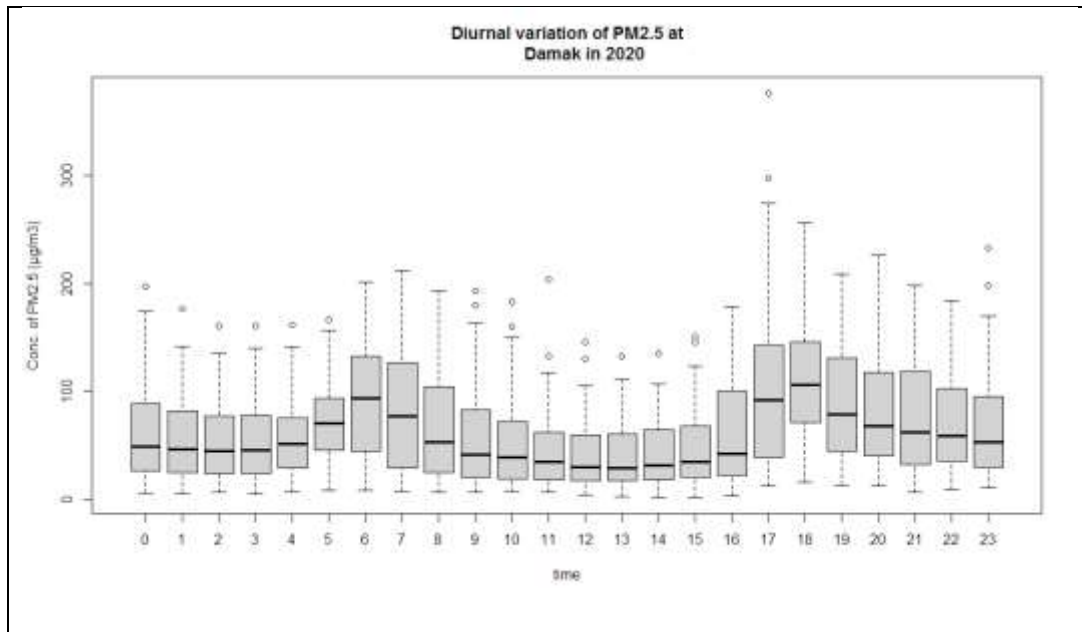


Figure 36. Boxplot of diurnal variation of PM2.5 at Damak in 2020

Above figure shows PM2.5 concentrations was highest at 6 o'clock in the morning and 18 o'clock in the evening. It was more variable at 7 o'clock in the morning and 17 o'clock in the evening.

Compliance with National Ambient air Quality standard

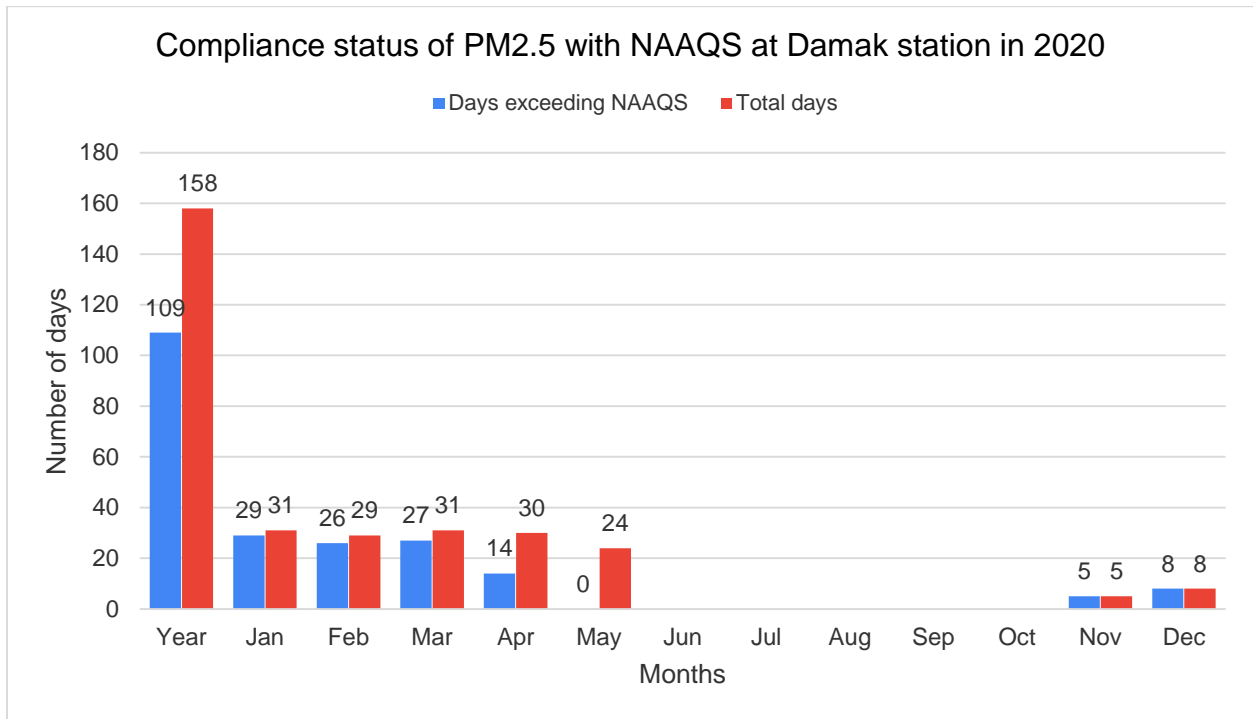


Figure 37. Compliance with National Ambient air quality standard for PM2.5 at Damak station in 2020

Out of total 158 days of Measurement 109 days exceeded the National ambient air quality standard for PM2.5 at Damak station in 2020.

2.2.4 Temporal Variation of PM10

Annual Average

The annual average PM10 at Damak station on 2020 was $91.60 \mu\text{g}/\text{m}^3$.

Following figure shows the Histogram of PM10 at Damak station in 2020.

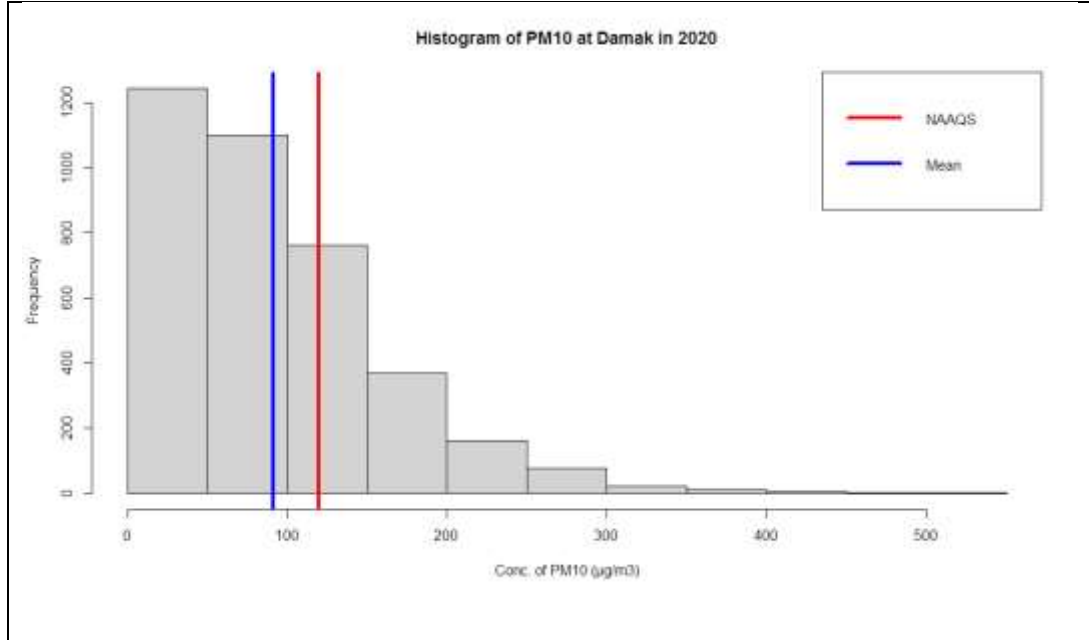


Figure 38. Histogram of PM10 at Damak in 2020

Above figure shows that highest no of hourly average data were between $0-50 \mu\text{g}/\text{m}^3$ followed by $50-100 \mu\text{g}/\text{m}^3$

Daily average of PM10

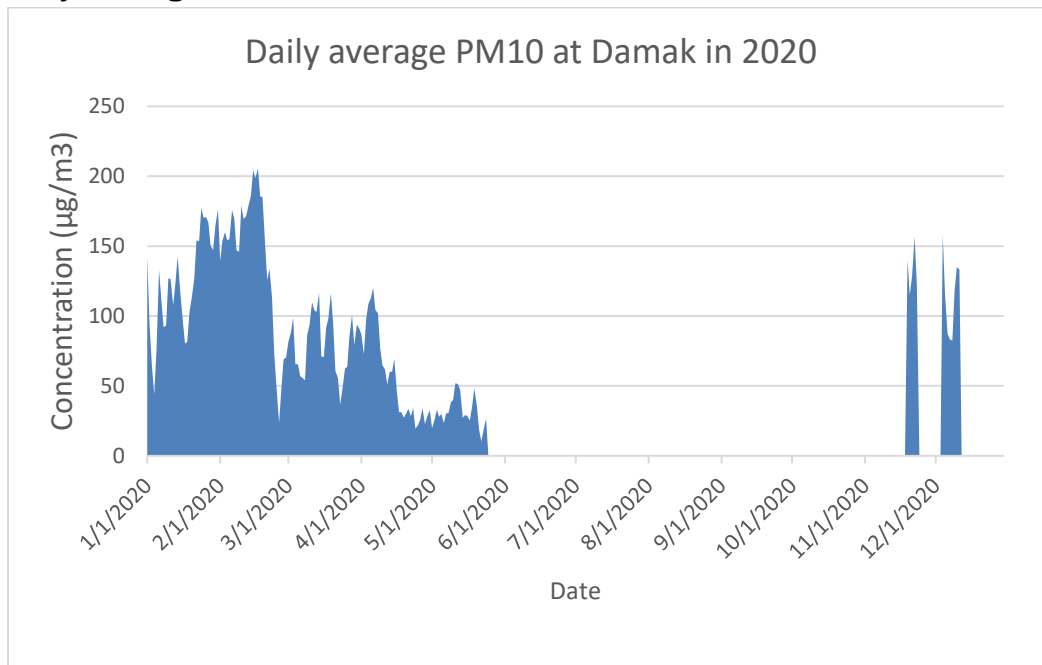


Figure 39. Daily average PM10 at Damak station in 2020

Monthly Average of PM10

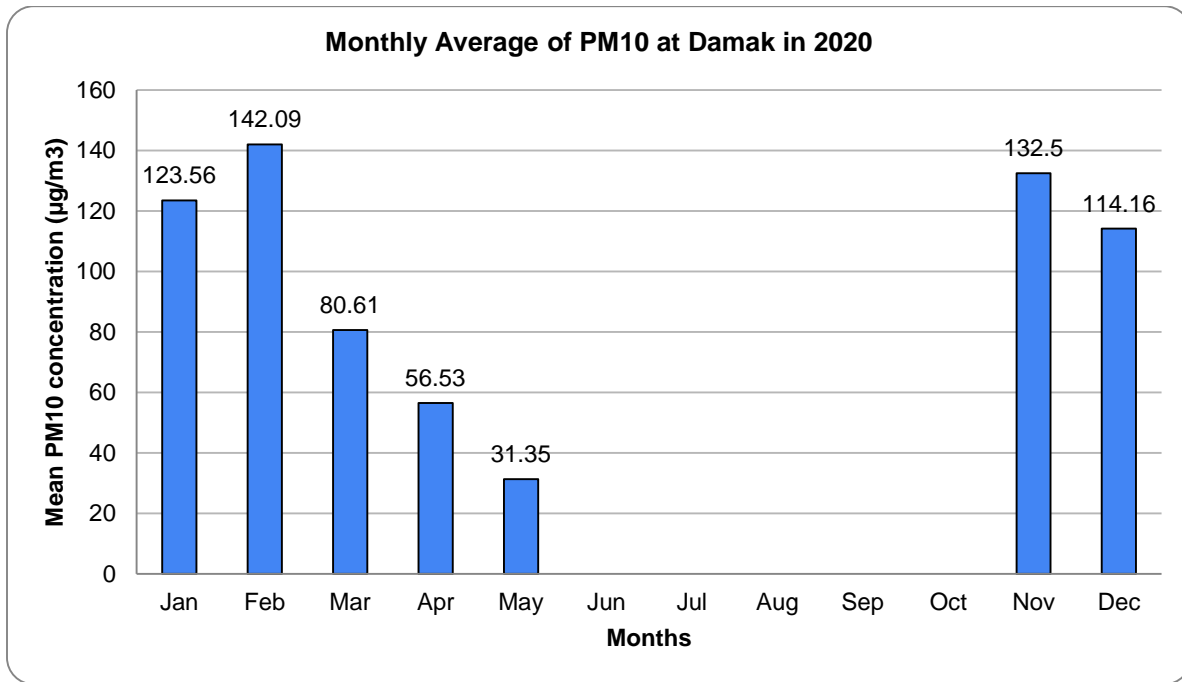


Figure 40. Monthly average PM10 at Damak station in 2020

Above figure shows that the highest monthly average value of PM10 was found in February with average value of $142.09 \mu\text{g}/\text{m}^3$ and lowest average was found in May with average value of $31.35 \mu\text{g}/\text{m}^3$.

Monthly Variation of PM10

Following figure shows the boxplot of monthly variation of PM10 at Damak in 2020

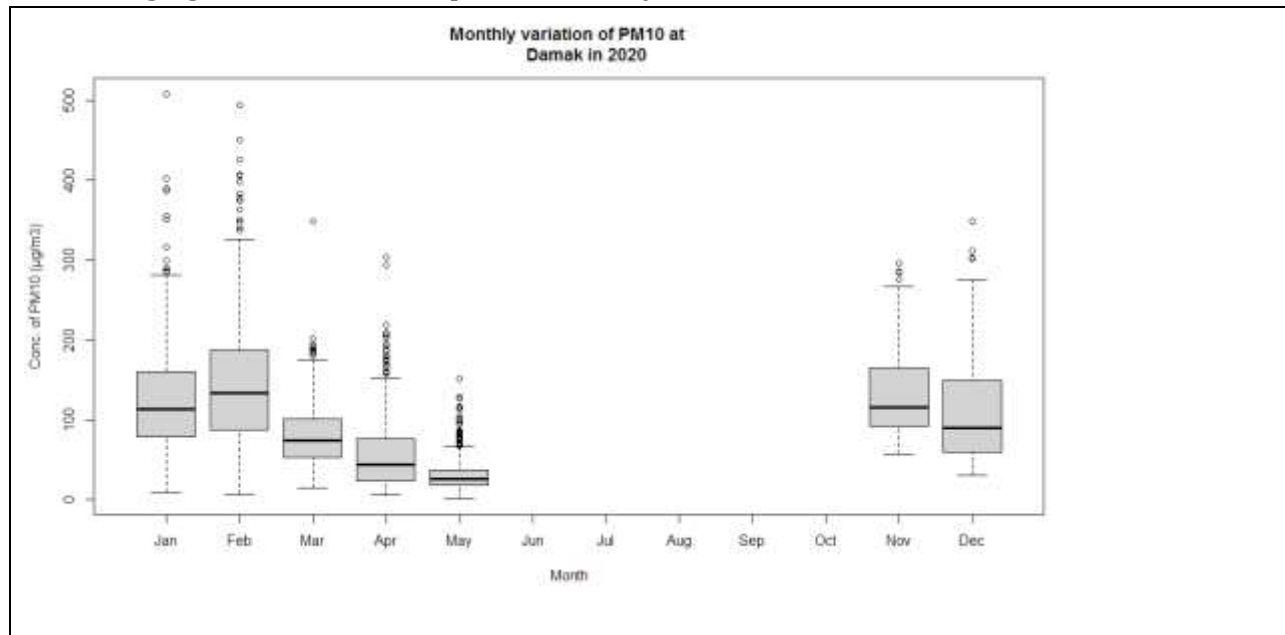


Figure 41. . Boxplot of monthly variation of PM10 at Damak in 2020

Above figure shows more variation of hourly average PM10 on february.

Seasonal Average of PM10

Following figure shows seasonal average of PM10 at Damak in 2020.

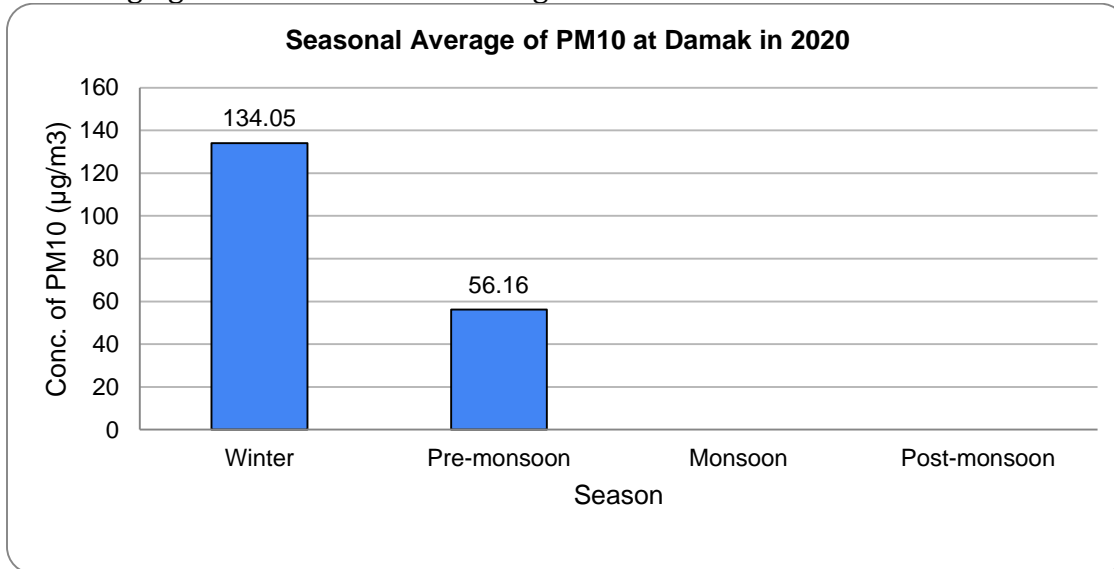


Figure 42. Seasonal average of PM10 at Damak station on 2020

Among two seasons having seasonal average winter season has higher seasonal average.

Diurnal Variation of PM10

Following figure shows the diurnal variation of PM10 at Damak in 2020.

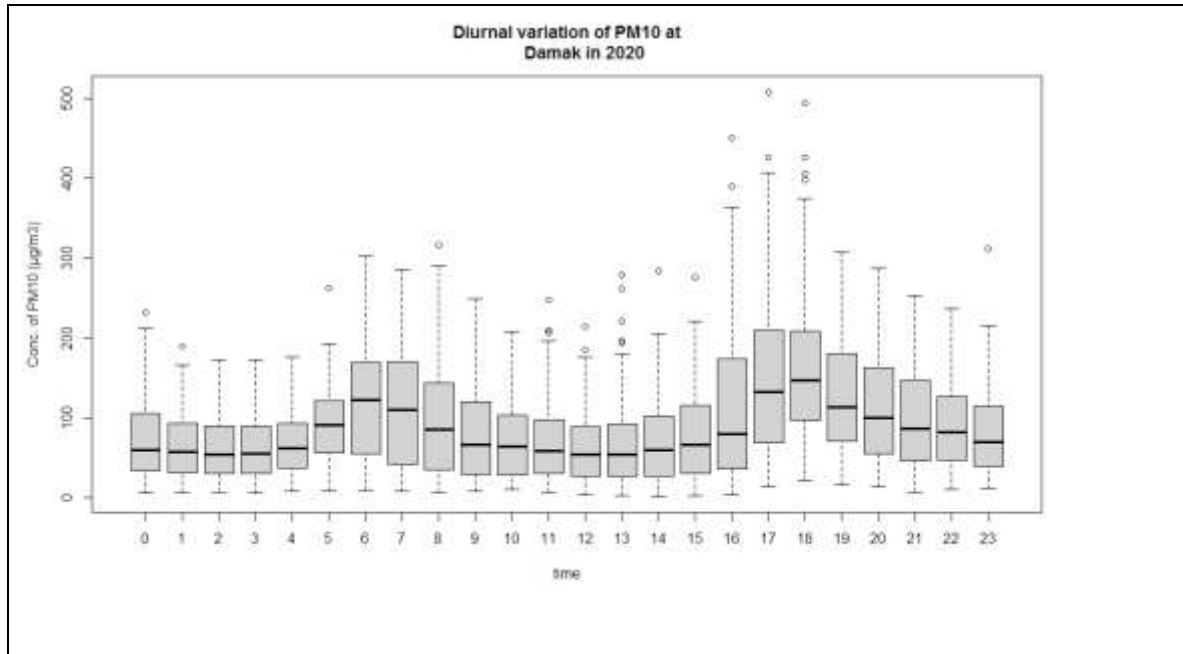


Figure 43. Diurnal variation of PM10 at Damak in 2020

The boxplot of diurnal variation shows PM10 concentration was highest at 6 O'clock in the morning and 18 o'clock in the evening. It was more variable at 7 o'clock in the morning and the evening.

Compliance with National Ambient Air quality standard

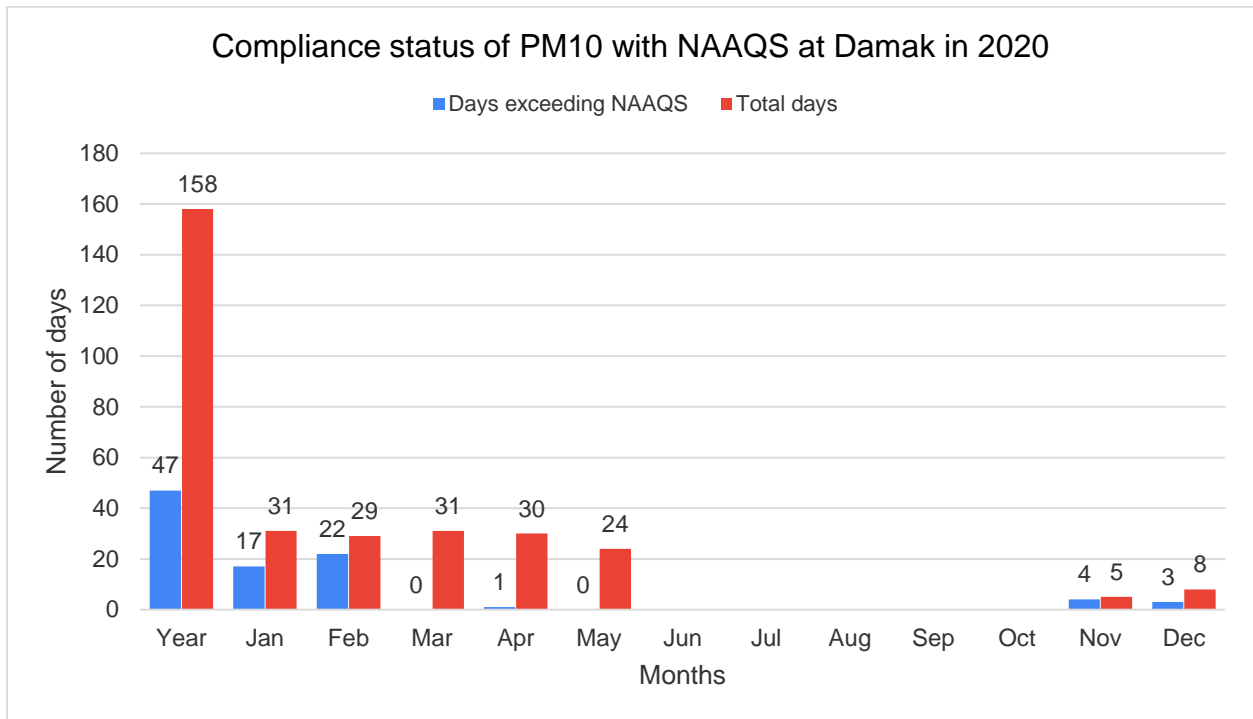


Figure 44. Compliance with National Ambient air quality standard for PM10 at Damak station in 2020

Out of 158 days of measurement 47 days exceed the National Ambient air quality standard for PM10 at Damak station on 2020.

2.2.5 Temporal Variation of TSP

Annual Average of TSP

Annual TSP average of Damak Station for the year 2020 was observed to be $141.60 \mu\text{g}/\text{m}^3$. Following figure shows the histogram of TSP at Damak in 2020.

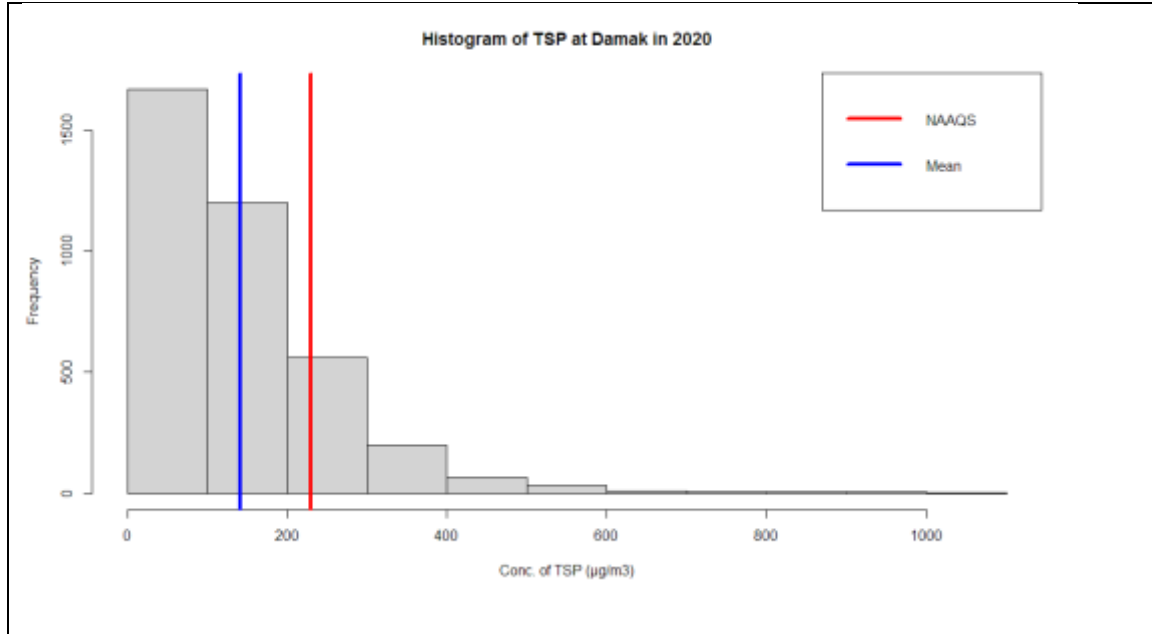


Figure 45. Histogram of TSP at Damak station in 2020

Above figure shows highest no of hourly average of Total suspended Particulate data were between 0-100 $\mu\text{g}/\text{m}^3$ followed by 100-200 $\mu\text{g}/\text{m}^3$.

Daily average of TSP

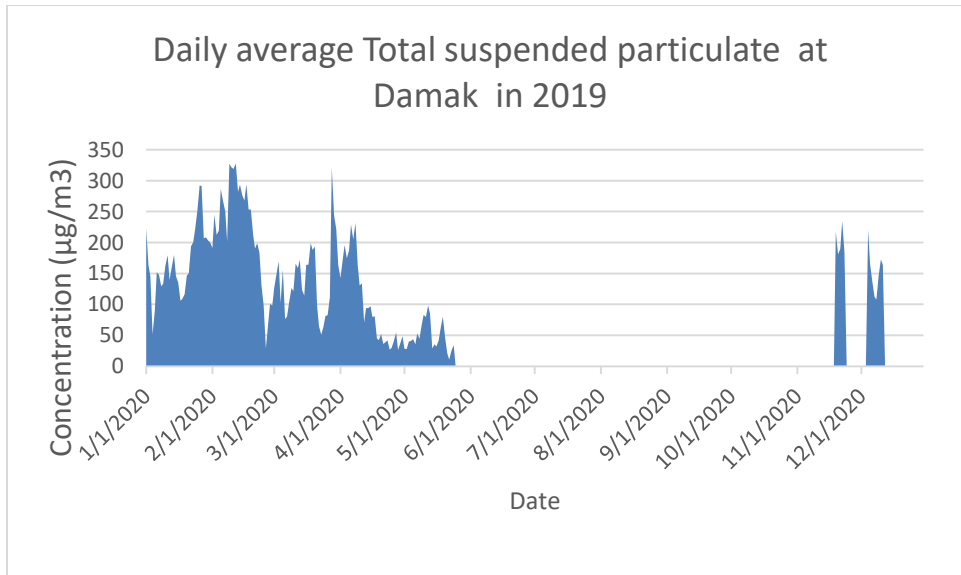


Figure 46. Daily average total suspended particulate at Damak in 2020

Monthly Average of TSP

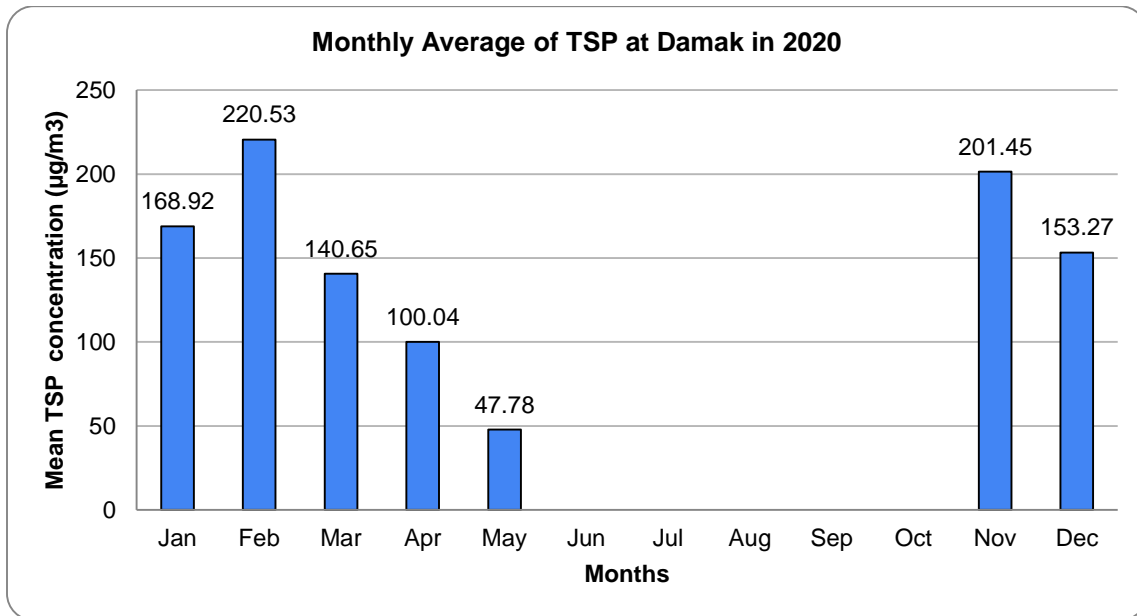


Figure 47. Monthly average of TSP at Damak station in 2020

Above figure shows that the monthly average value of TSP was highest in February with monthly average value of $220.53 \mu\text{g}/\text{m}^3$ and lowest in May with value of $47.78 \mu\text{g}/\text{m}^3$.

Monthly variation of TSP

Following figure shows Boxplot of monthly variation of TSP at Damak in 2020

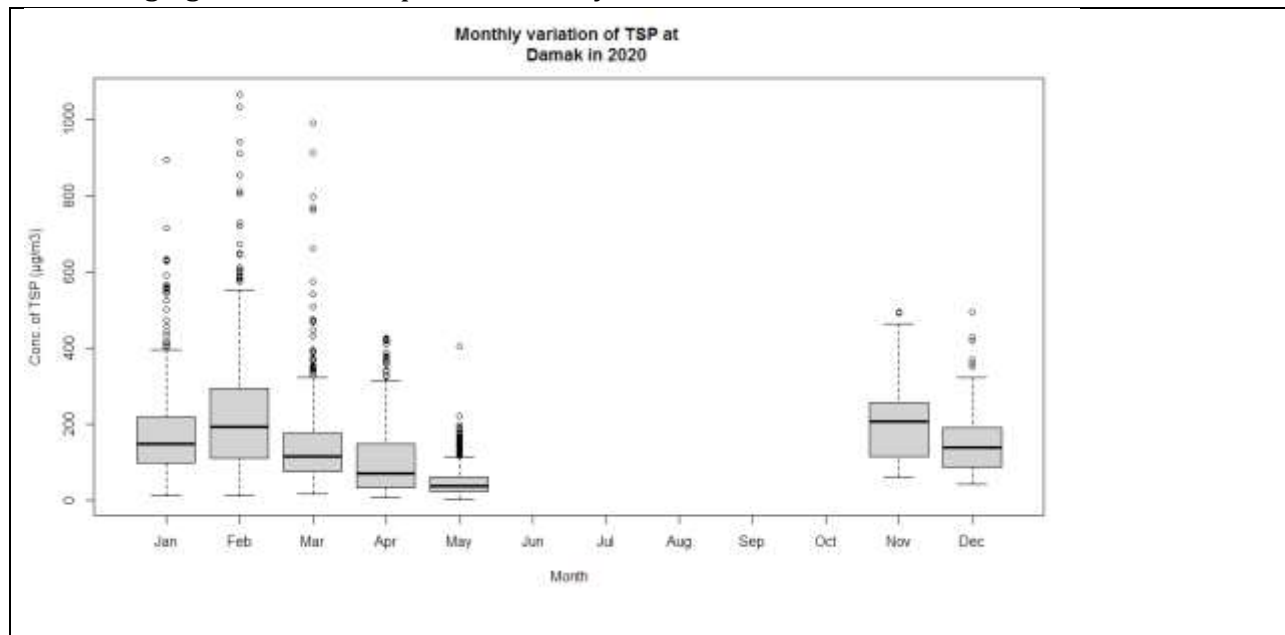


Figure 48. Monthly variation of daily average Total suspended particulate at Damak in 2020

The above figure shows that highest level of variation was seen in February.

Seasonal Average of TSP

Following figure shows the seasonal average of TSP at Damak station in 2020

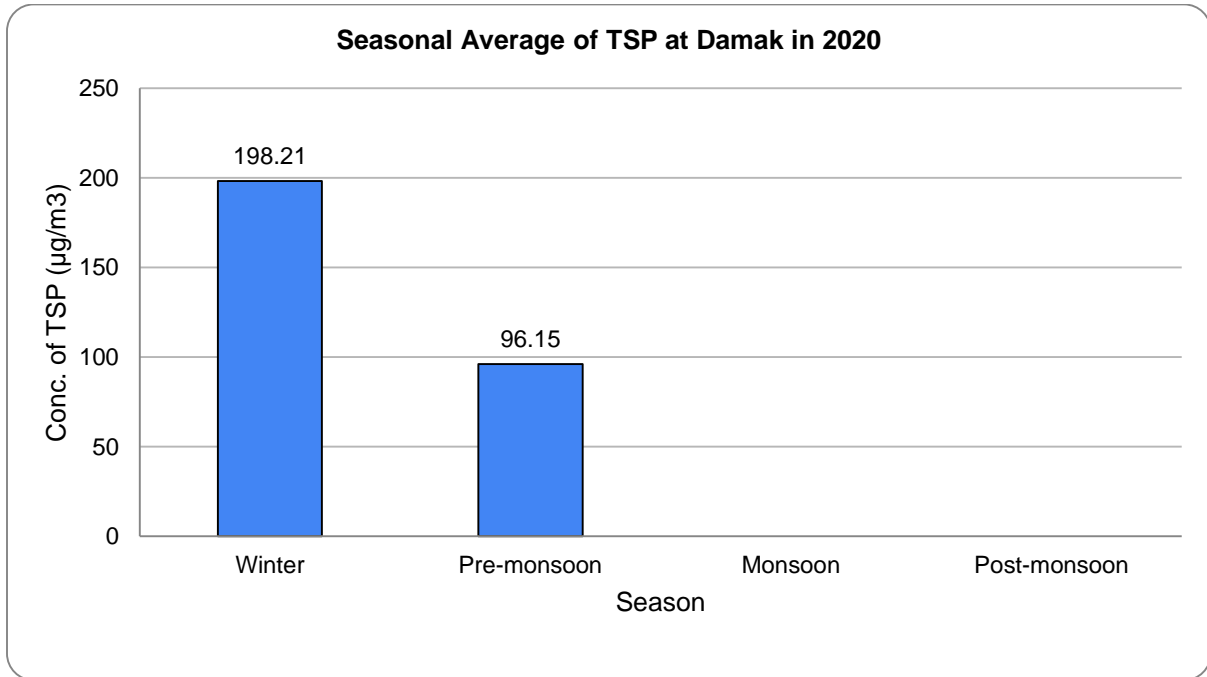


Figure 49. Seasonal average of TSP at Damak station on 2020

Diurnal Variation of TSP

Following figure shows the boxplot of diurnal variation of TSP at Damak in 2020.

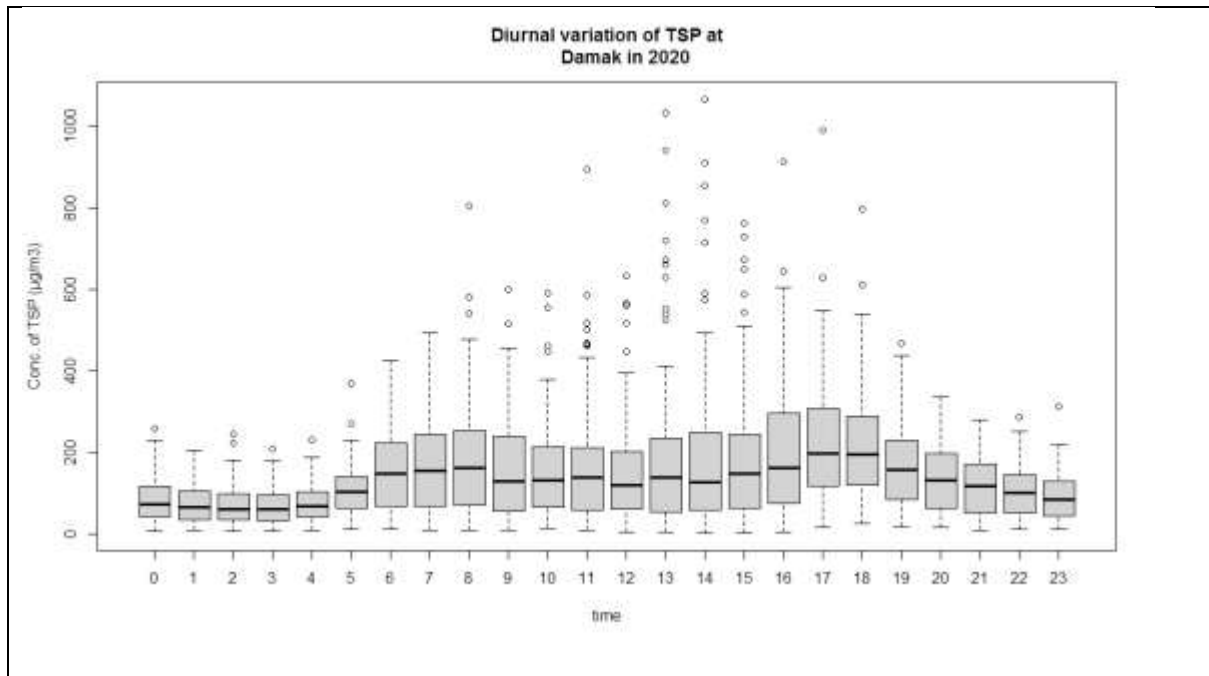


Figure 50. Diurnal variation of TSP at Damak station on 2017

Above figure shows that Total suspended Particulate concentration was highest at 17 o'clock and variation was high at 16 o'clock. The diurnal variation shows TSP concentration was high during day time.

Compliance with National Ambient air quality Standard

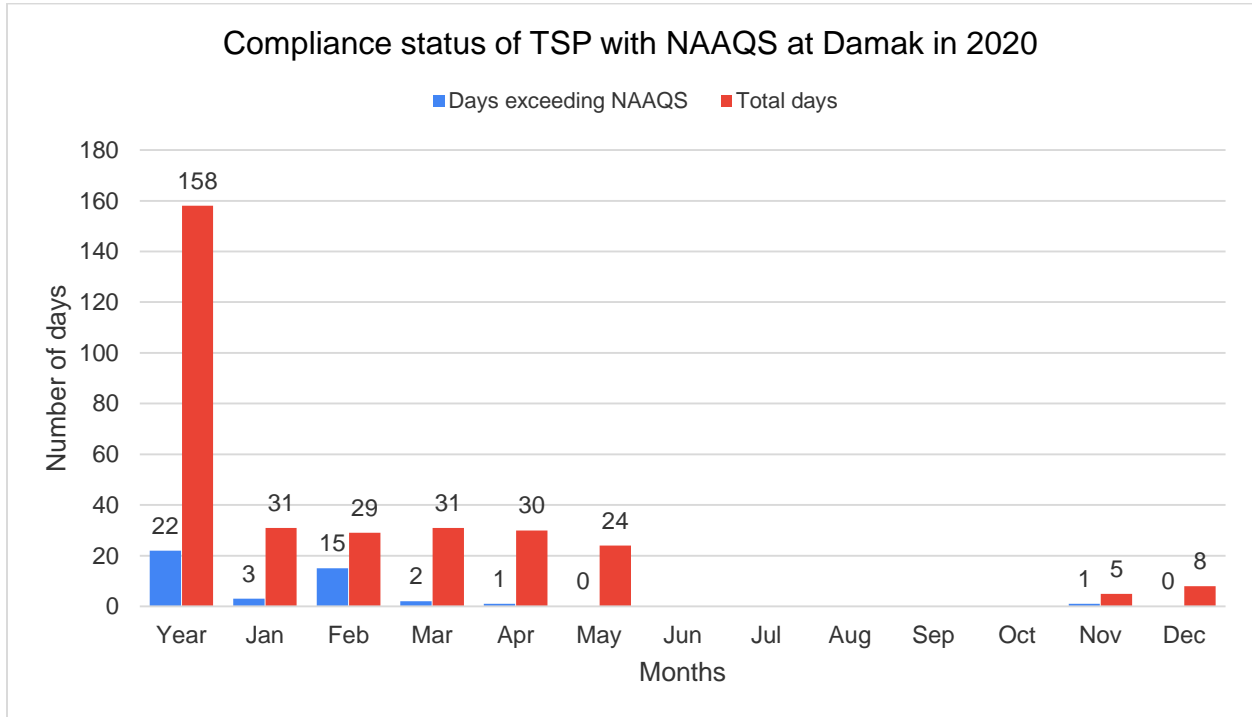


Figure 51. Compliance with National Ambient air quality standard for TSP at Damak station in 2020

Out of 158 days of measurement 22 days exceed the National ambient air quality standards for the Total suspended particulate.