

JOINT QUALITY OF SERVICE SURVEY OF 1ST QUARTER 2019

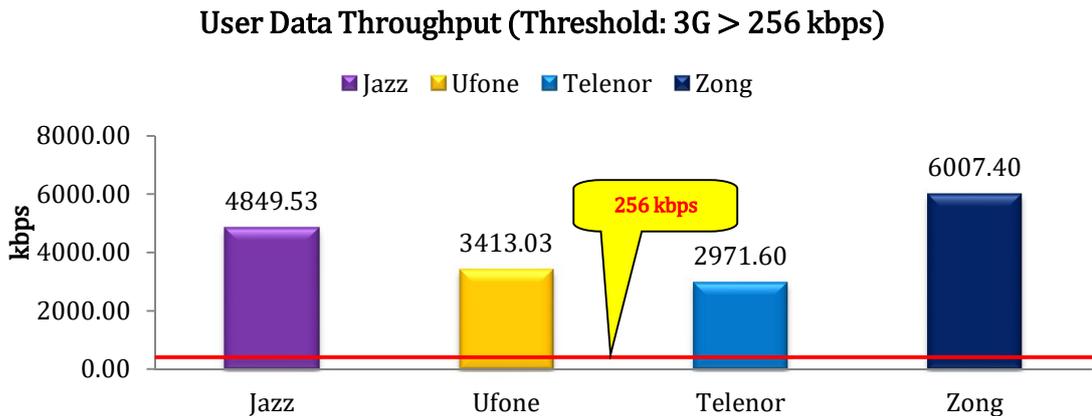
Pakistan Telecommunication Authority (PTA) has conducted joint Quality of Service (QoS) survey with Cellular Mobile Operators (CMOs), in 1st quarter of 2019, using NEMO automated QoS tool. During the period, a total of nine (9) cities of Punjab, Sindh and KPK have been surveyed. The names of these cities are as under:

S. #.	Name	S. #.	Name	S. #.	Name
1	D.I.Khan	4	Nawabshah	7	Sahiwal
2	Peshawar	5	Shikarpur	8	Bhakkar
3	Larkana	6	Jacobabad	9	Jhang

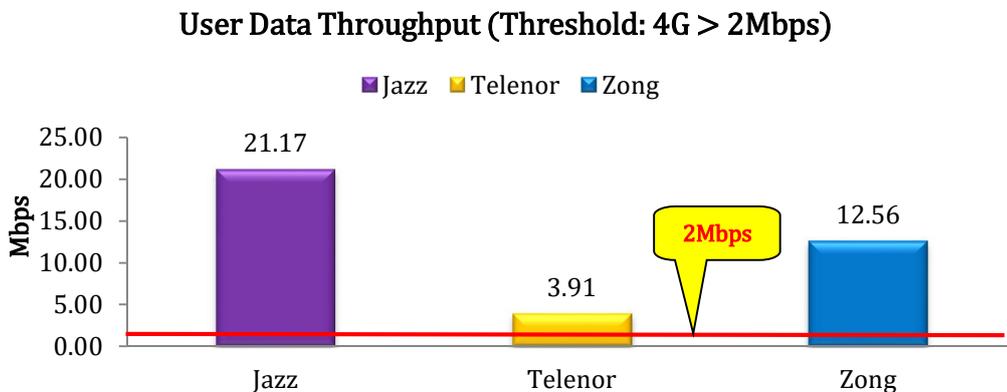
DATA – KEY PERFORMANCE INDICATORS (OVERALL RESULTS)

Data KPIs. The performance of data services of CMOs has been checked by measuring two Key Performance Indicators (KPIs) i.e. User Data Throughput and Signal Strength (Received Signal Code Power (RSCP) for 3G & Received Signal Receive Power (RSRP) for 4G).

User Data Throughput *This KPI defines user data rate (Internet speed) to be provided by NGMS operators to mobile users across the coverage areas. The data throughput results of all NGMS licensees are as under:*



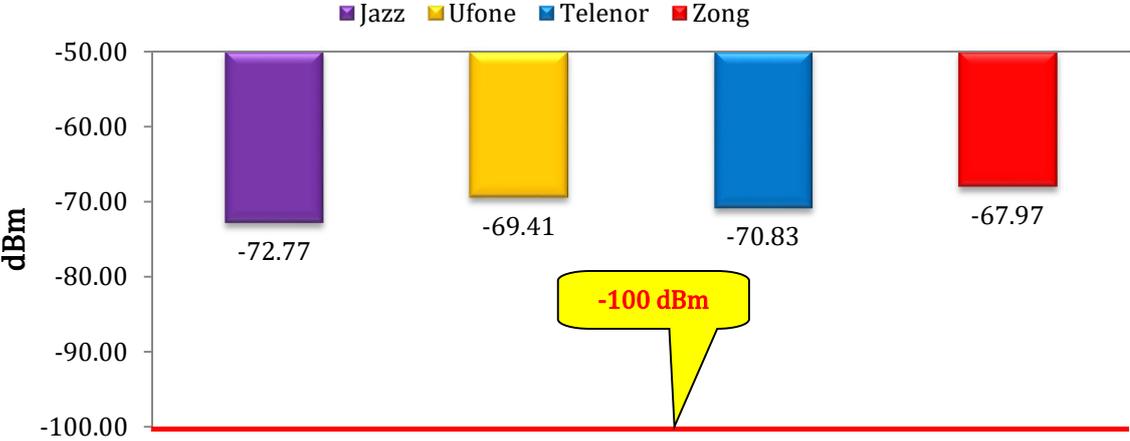
User data “throughput” of 3G services found higher than the benchmark value of 256Kbps



User data “throughput” of 4G services found higher than the benchmark value of 2Mbps

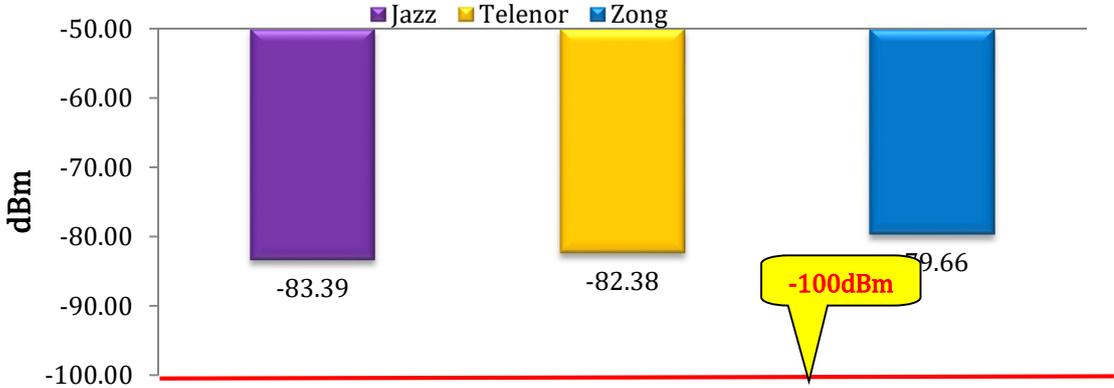
SIGNAL STRENGTH. This KPI defines Received Signal Code Power (RSCP) for 3G and Received Signal Receive Power (RSRP) for 4G and denotes the power measured by a receiver on a particular physical communication channel. It is used as an indication of signal strength, as a handover criterion, in downlink power control, and to calculate path loss". The Signal Strength for NGMS licensees are as under:

Signal Strength (RSCP) - 3G (Threshold: Minimum -100dBm)



Signal Strength (RSCP) of 3G network has been observed greater than -100dBm threshold value

Signal Strength (RSRP) - 4G (Threshold: Minimum -100dBm)

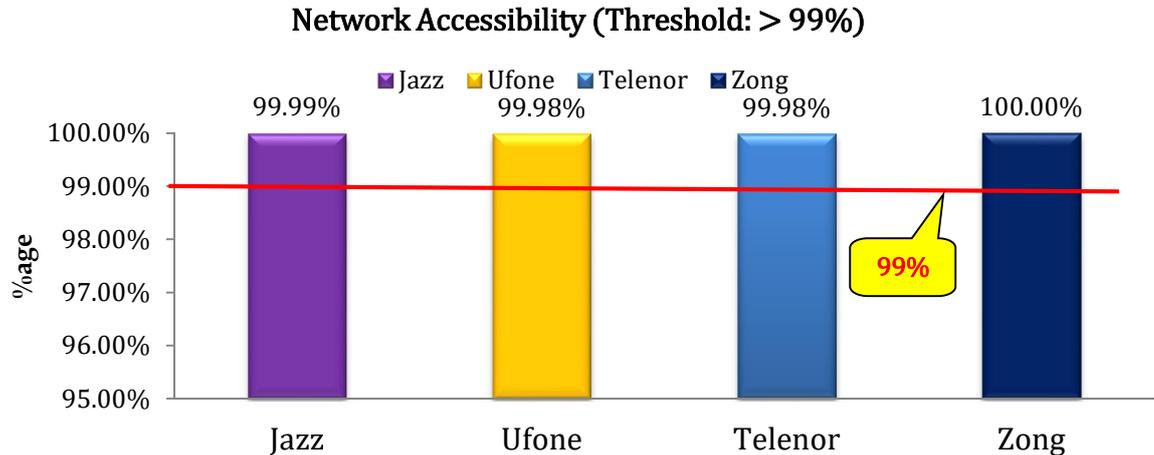


Signal Strength (RSRP) of 4G network has been observed greater than -100dBm threshold value

VOICE – KEY PERFORMANCE INDICATORS (OVERALL RESULTS)

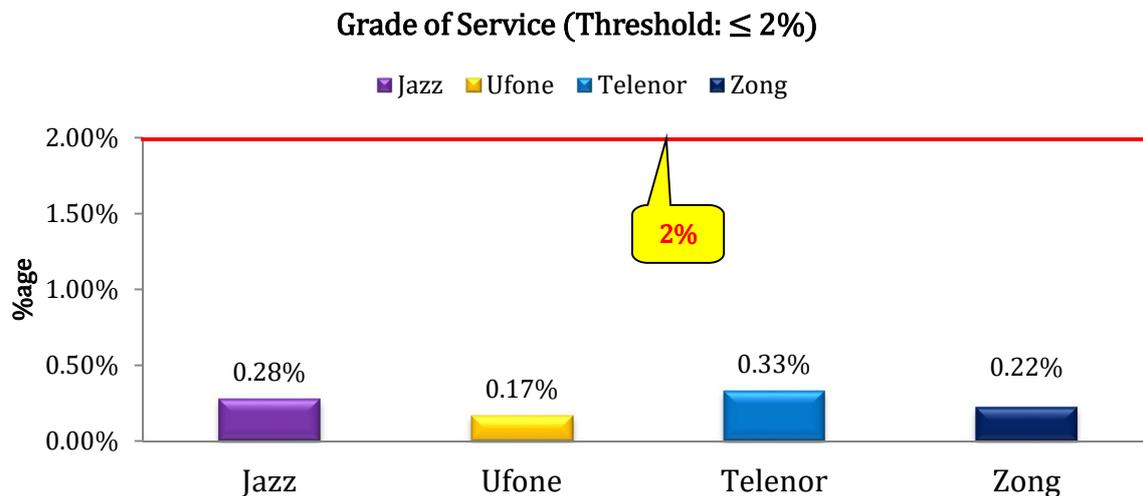
Voice KPIs. The performance of voice services of CMOs has been checked by measuring Network Down Time/Network Accessibility, Grade of Service, Service Accessibility, Call Connection Time, Call Completion Ratio, End-to-End Speech Quality and Session Abnormal Release Rate KPIs.

Network Accessibility. *“The probability that mobile services are available to an end customer display of the network indicator on the mobile equipment”.*



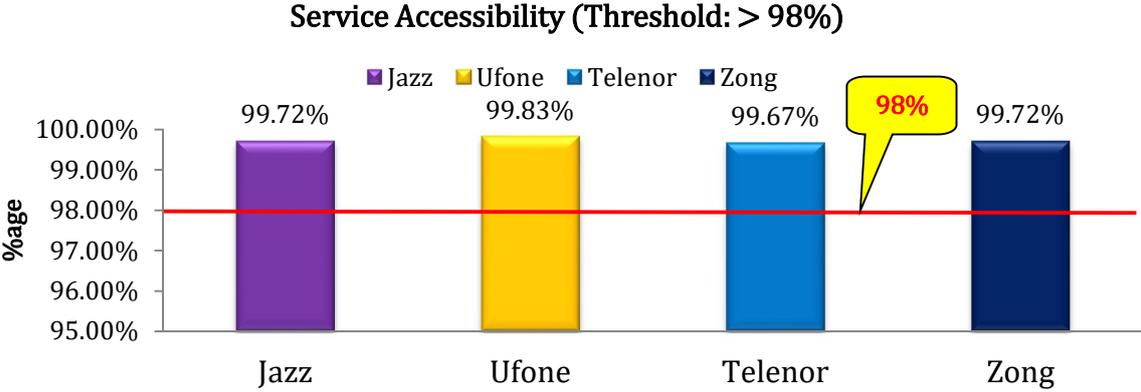
Network Accessibility is converse of Network Down Time and its value found greater than threshold value of 99% of all the mobile operators

Grade of Service (GOS). *“Grade of Service is probability that the end customer cannot access the mobile services when requested if it is offered by display of the network indicator on the mobile phone. In simple words, Grade of Service is Network Blocking”.*



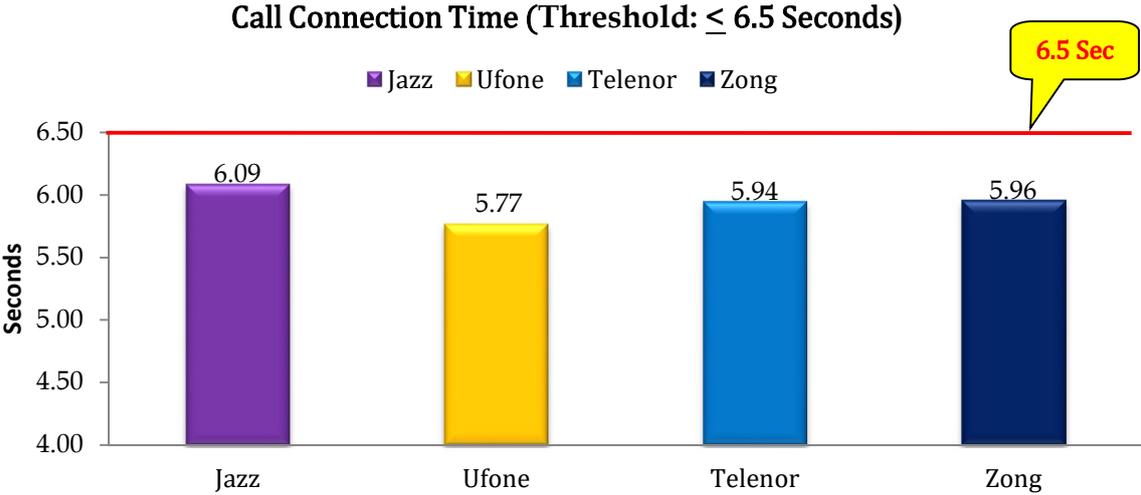
All mobile operators are meeting the threshold value of Grade of Service

Service Accessibility. "Service Accessibility is the probability that the user can access the desired service. A given network accessibility is a precondition for this phase".



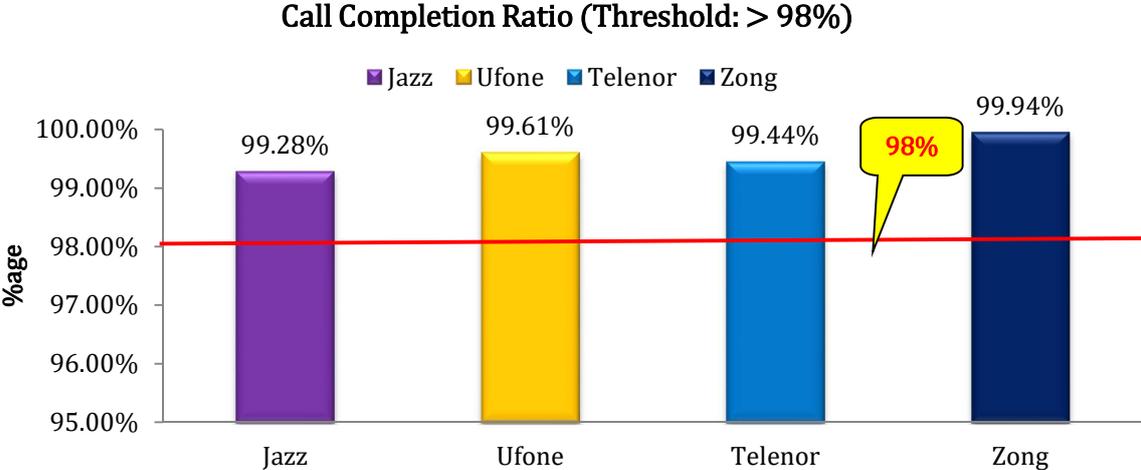
All mobile operators are meeting the criteria of Service Accessibility

Call Connection Time. "Call Connection Time is the time between sending of complete call initiation information by the caller and in return receipt of call setup notification. In simple words, it is time between dialing a number and hearing ring-back tone".



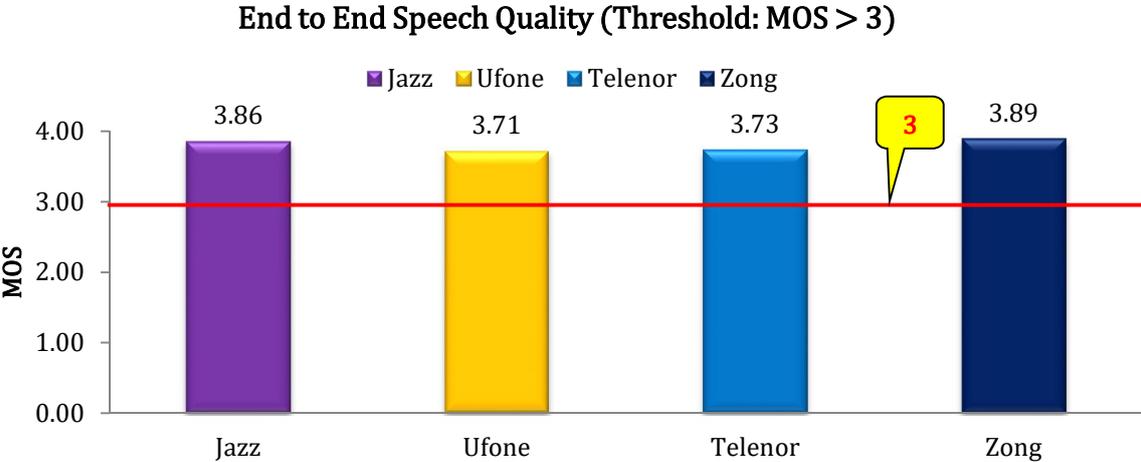
All CMOs are following the benchmark of Call Connection Time of 6.5 seconds

Call Completion Ratio. "Call Completion Ratio is the probability that a service, once obtained, will continue to be provided under given conditions for a given time duration or until deliberately terminated by either caller (A-party) or receiver (B-party). In simple words, this KPI provides information about Call Drops".



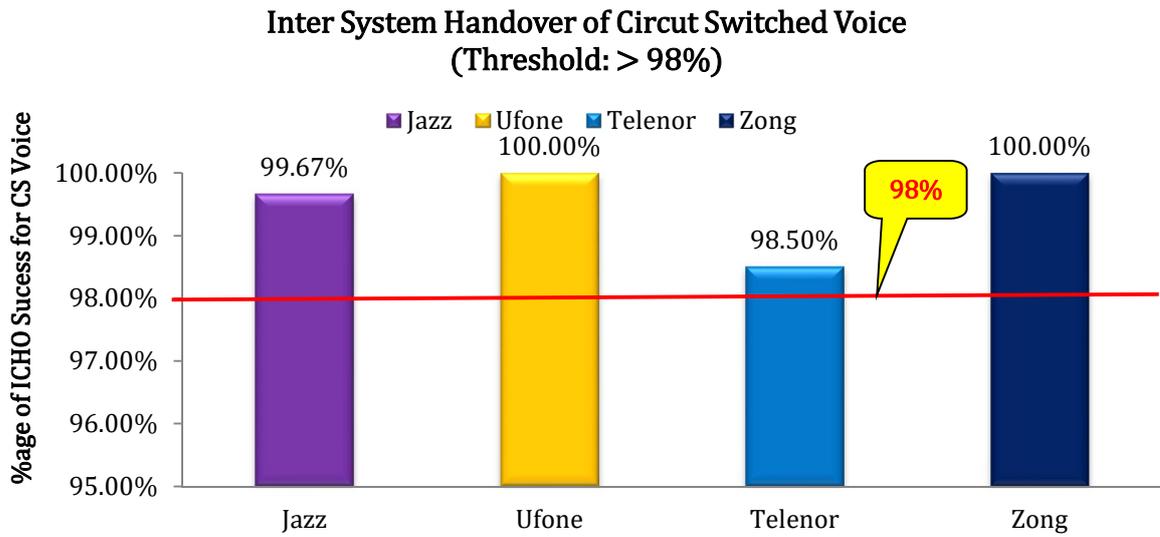
All mobile operators are meeting Call Completion Ratio threshold value of 98%

End-to-End Speech Quality. End-to-End Speech Quality is the degree of speech quality that a listener perceives at the terminal/mobile with a talker at the other end. In simple words, it provides information about clarity of voice.



End-to-End Speech Quality /Mean Opinion Score (MOS) of all mobile operators found above the threshold value of 3

Inter System Handover (ISHO) For Circuit Switched Voice. *“Inter System Handover is the measurement of successfulness of Handover in 3G/2G for Circuit Switched Voice.”*

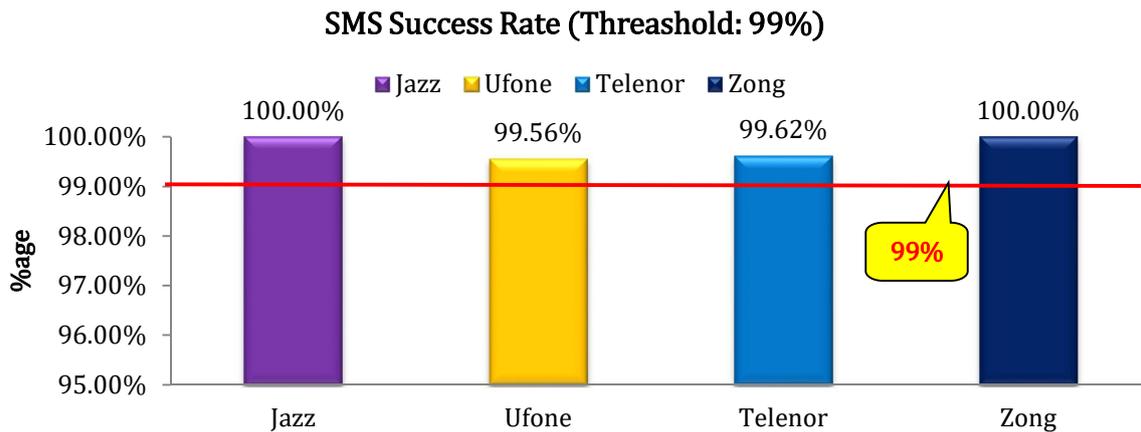


Inter System Handover of Circuit Switched Voice of all the mobile operators is above the threshold value of 98%

SMS – KEY PERFORMANCE INDICATORS (OVERALL RESULTS)

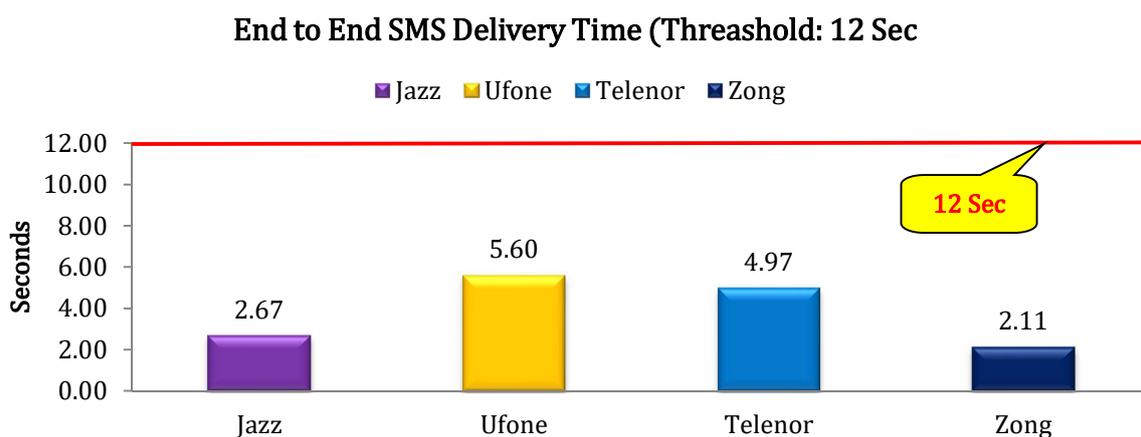
SMS KPIs. The performance of SMS services of CMOs has been checked by measuring SMS Success Rate and End-to-End SMS Delivery Time KPIs.

SMS Success Rate. *SMS Success Rate is the probability that the short message is delivered successfully, end-to-end when requested and display of the relevant information on the mobile phone. It provides information about successful delivery of SMS.*



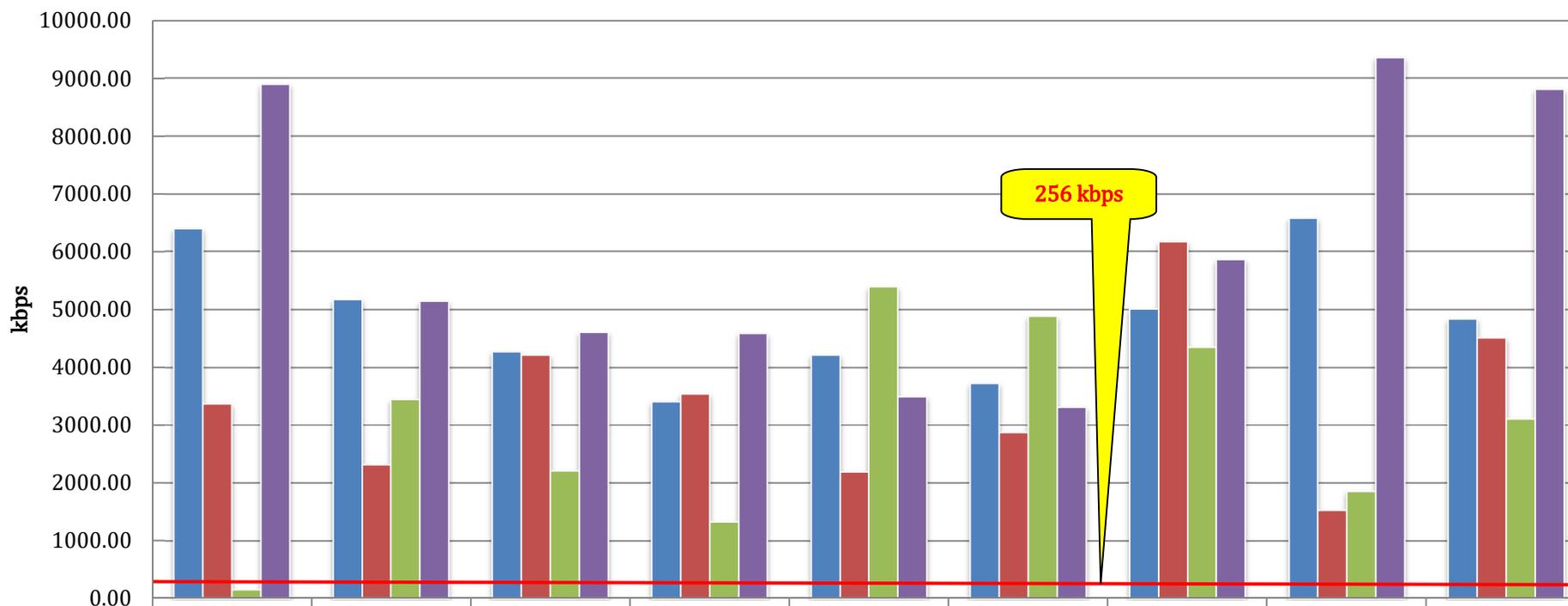
SMS Success Rate for all CMOs is above the threshold value of 99%

End-to-End SMS Delivery Time. *End-to-End SMS Delivery Time is the time between sending a short message to a short message center and receiving the very same short message at intended mobile phone (receiver). It provides average time taken for delivery of short message from sender to recipient.*



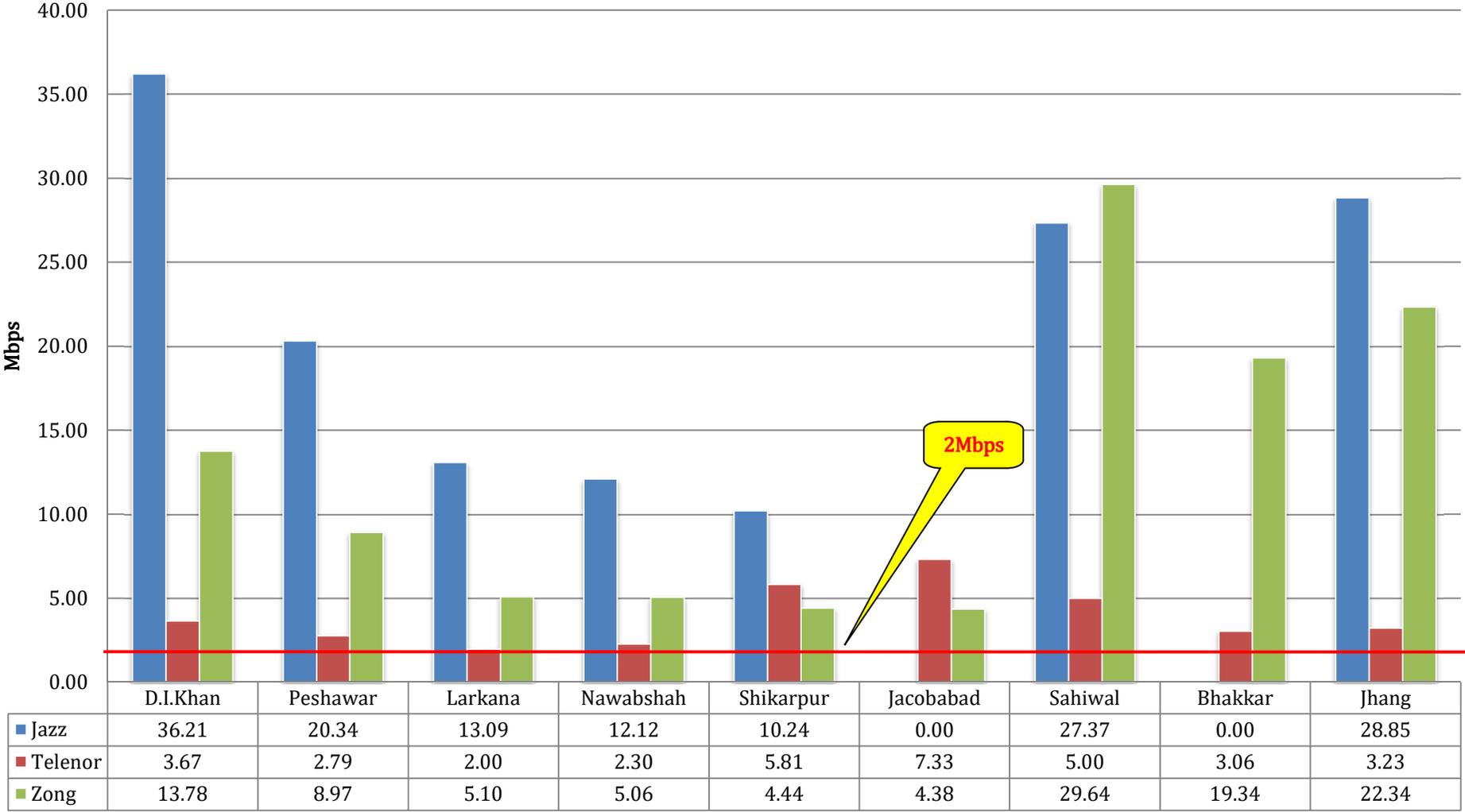
All CMOs are meeting the threshold for End-to-End SMS Delivery Time of 12 Seconds

User Data Throughput - Citywise Results (Threshold: 3G > 256 kbps)

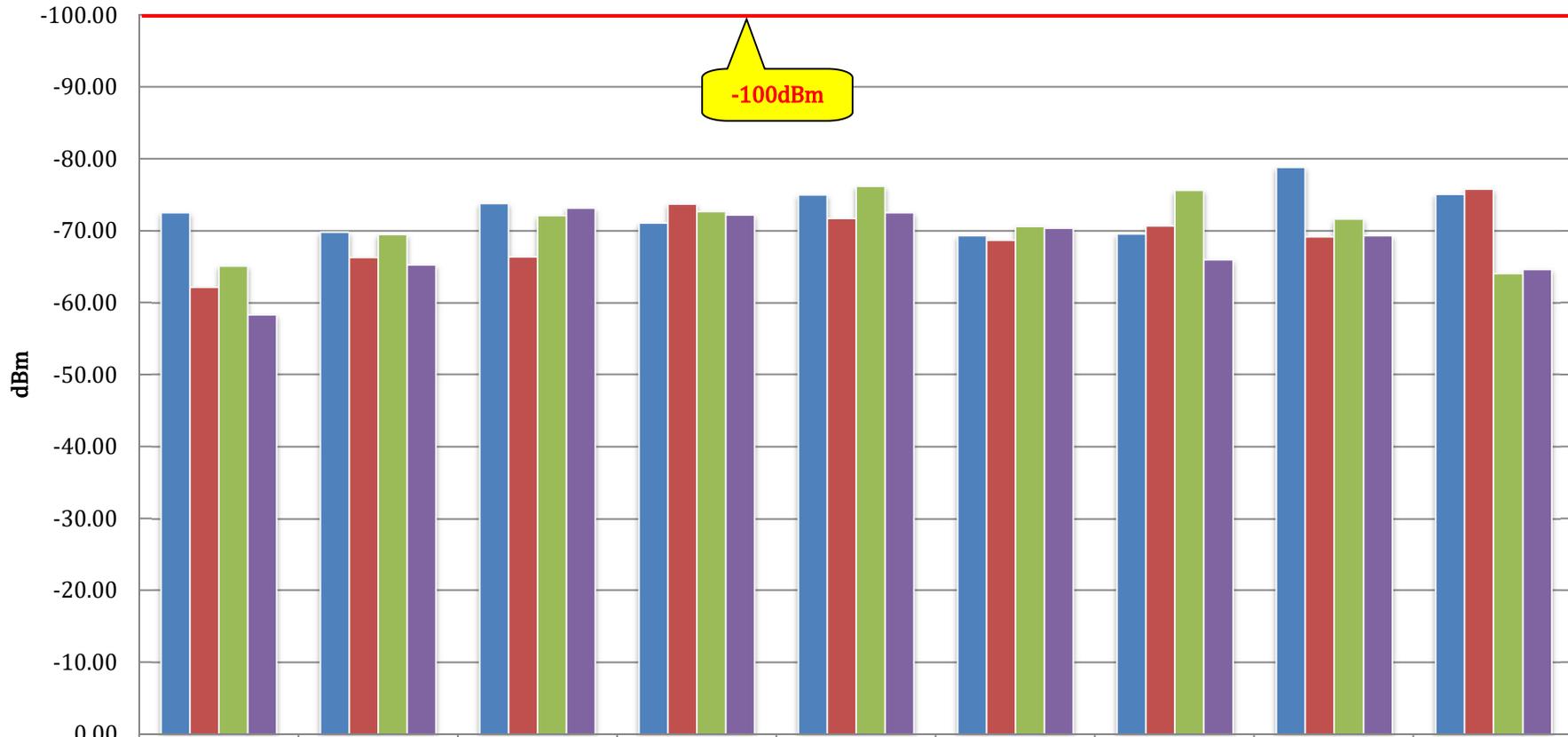


	D.I.Khan	Peshawar	Larkana	Nawabshah	Shikarpur	Jacobabad	Sahiwal	Bhakkar	Jhang
Jazz	6402.80	5169.50	4277.60	3417.40	4214.80	3724.90	5010.50	6586.30	4842.00
Ufone	3376.80	2316.60	4212.40	3543.00	2193.70	2864.40	6165.50	1533.90	4511.00
Telenor	162.00	3449.60	2211.10	1324.40	5391.20	4883.20	4351.50	1854.60	3116.80
ZonG	8894.50	5140.60	4606.20	4588.60	3503.20	3313.50	5858.40	9355.30	8806.30

User Data Throughput - Citywise Results (Threshold: 4G > 2Mbps)

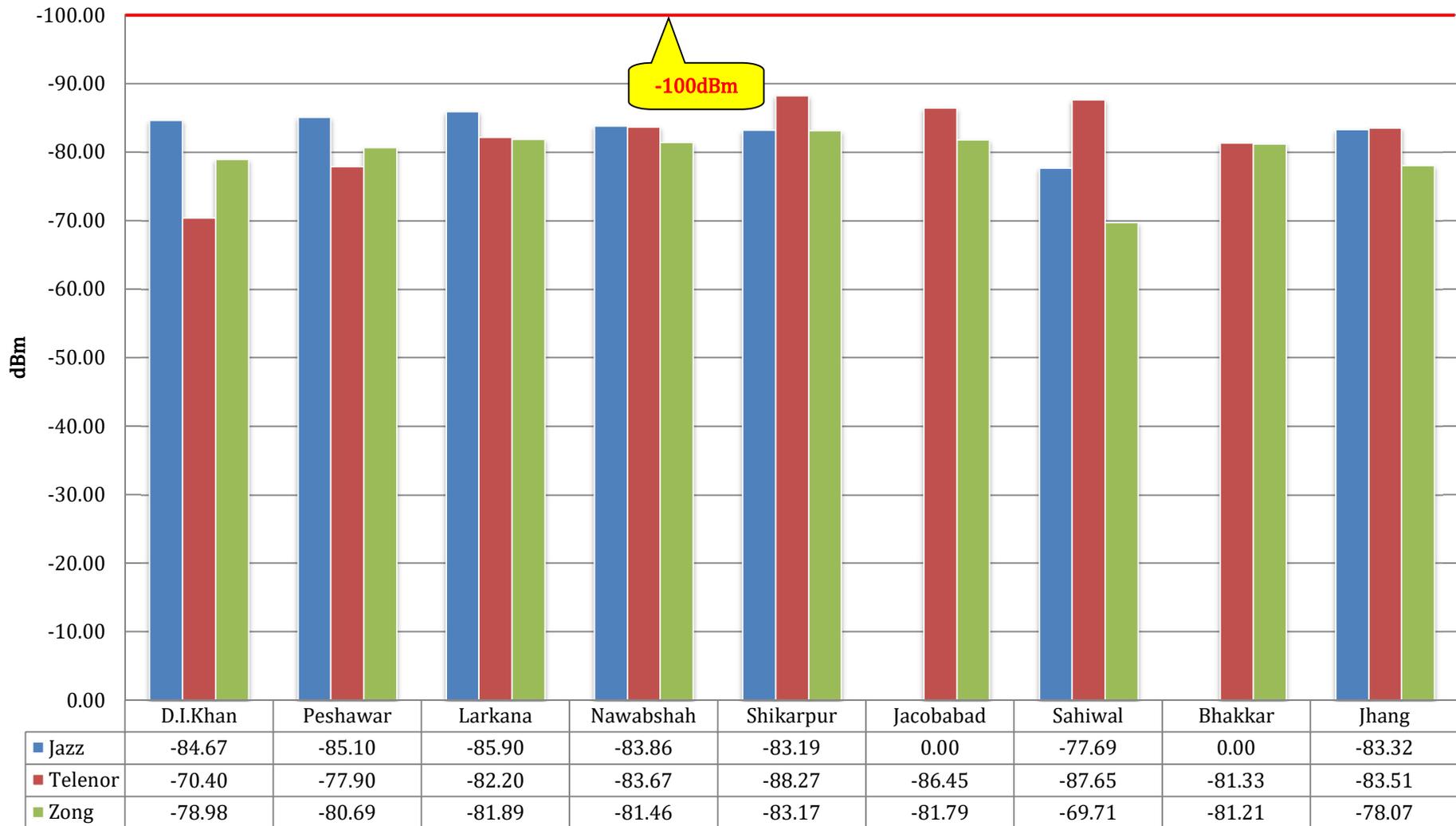


Signal Strength Received Signal Code Power (3G) - Citywise Results (Threshold: Minimum -100dBm)

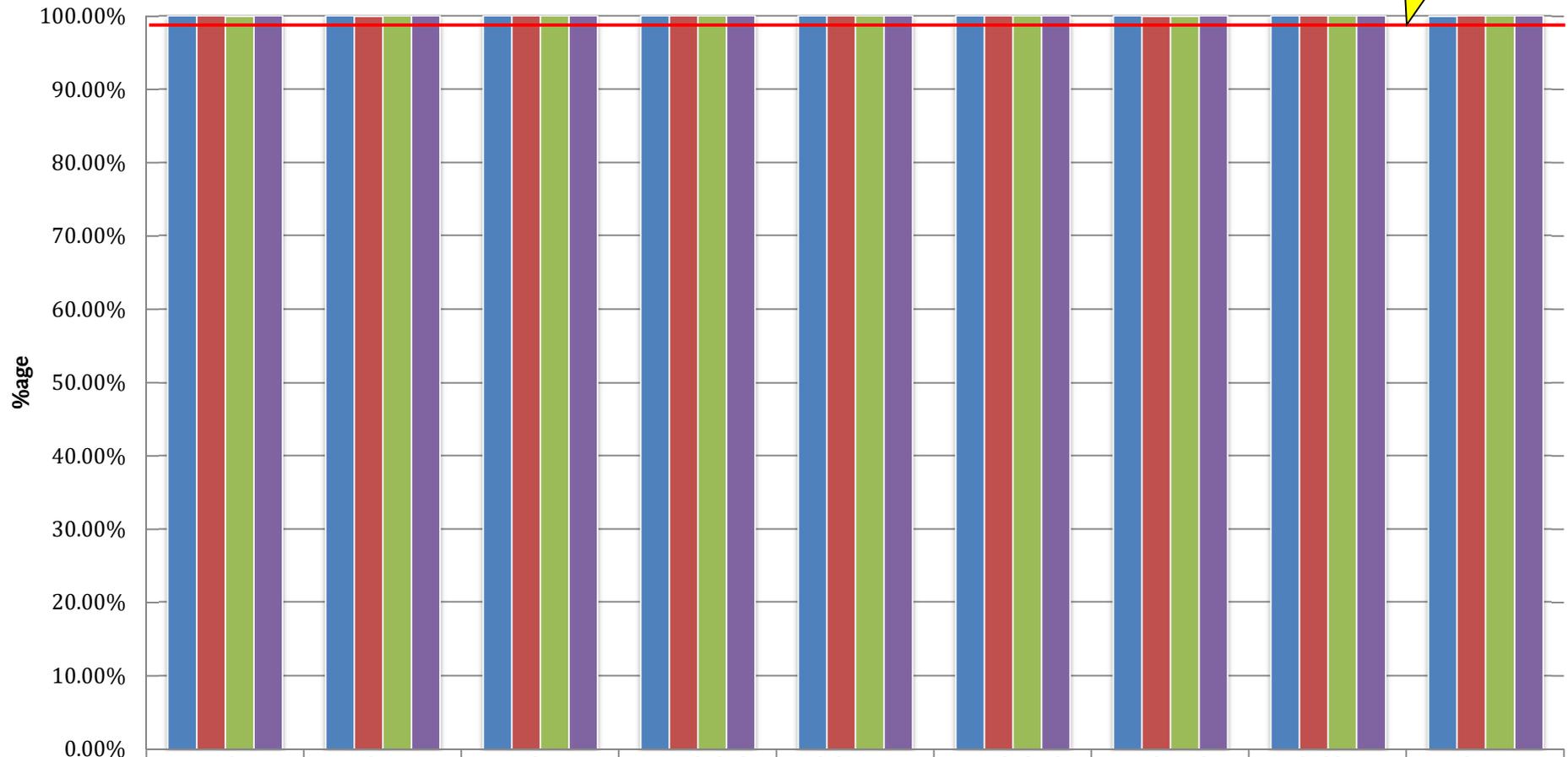


	D.I.Khan	Peshawar	Larkana	Nawabshah	Shikarpur	Jacobabad	Sahiwal	Bhakkar	Jhang
Jazz	-72.50	-69.80	-73.80	-71.10	-75.00	-69.30	-69.54	-78.82	-75.06
Ufone	-62.2	-66.3	-66.4	-73.7	-71.7	-68.7	-70.70	-69.20	-75.80
Telenor	-65.10	-69.50	-72.07	-72.70	-76.20	-70.60	-75.59	-71.65	-64.08
ZonG	-58.33	-65.25	-73.15	-72.21	-72.52	-70.35	-66.01	-69.30	-64.63

Signal Strength Received Signal Receive Power (4G) - Citywise Results (Threshold: Minimum-100dBm)

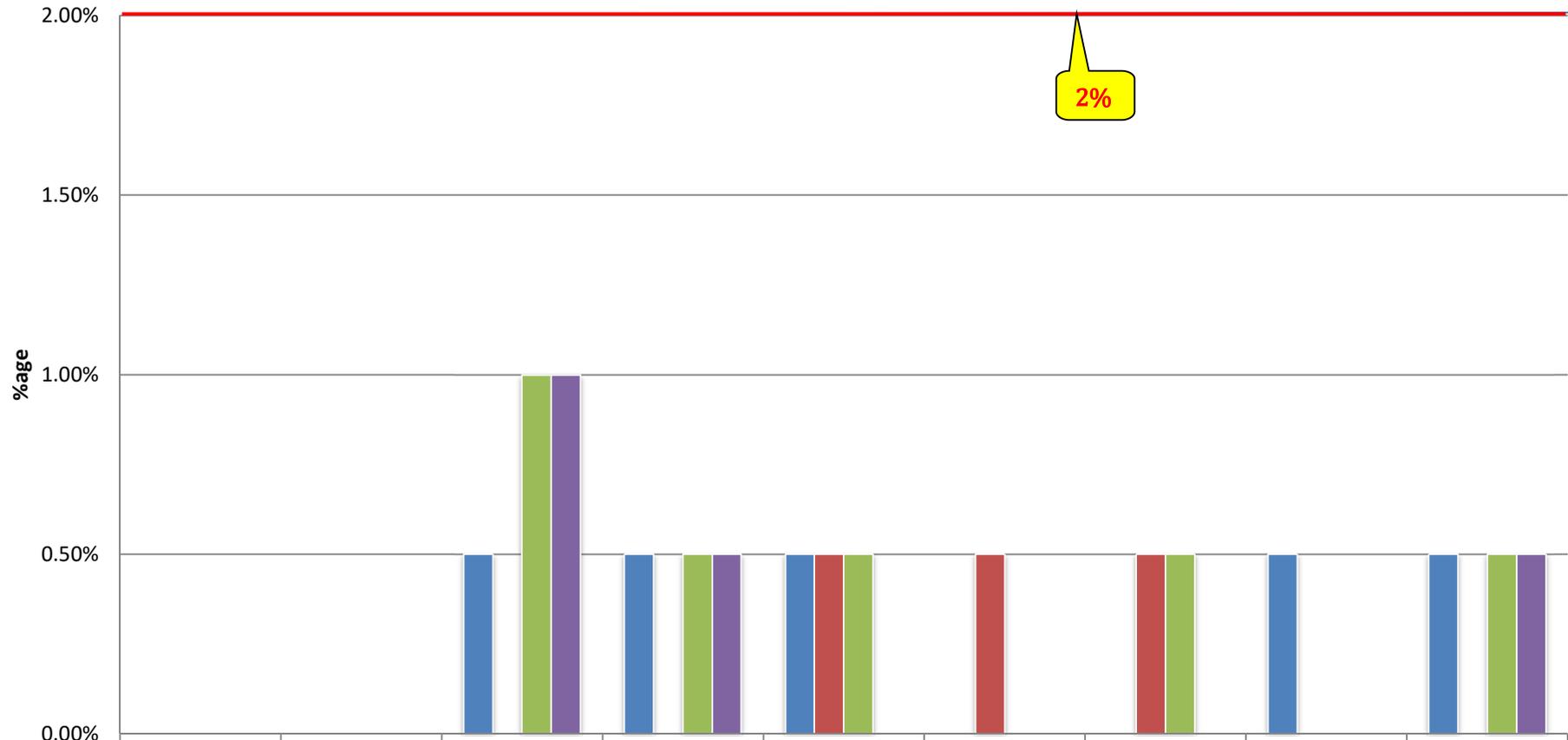


Network Accessibility - Citywise Results (Threshold: >99%)



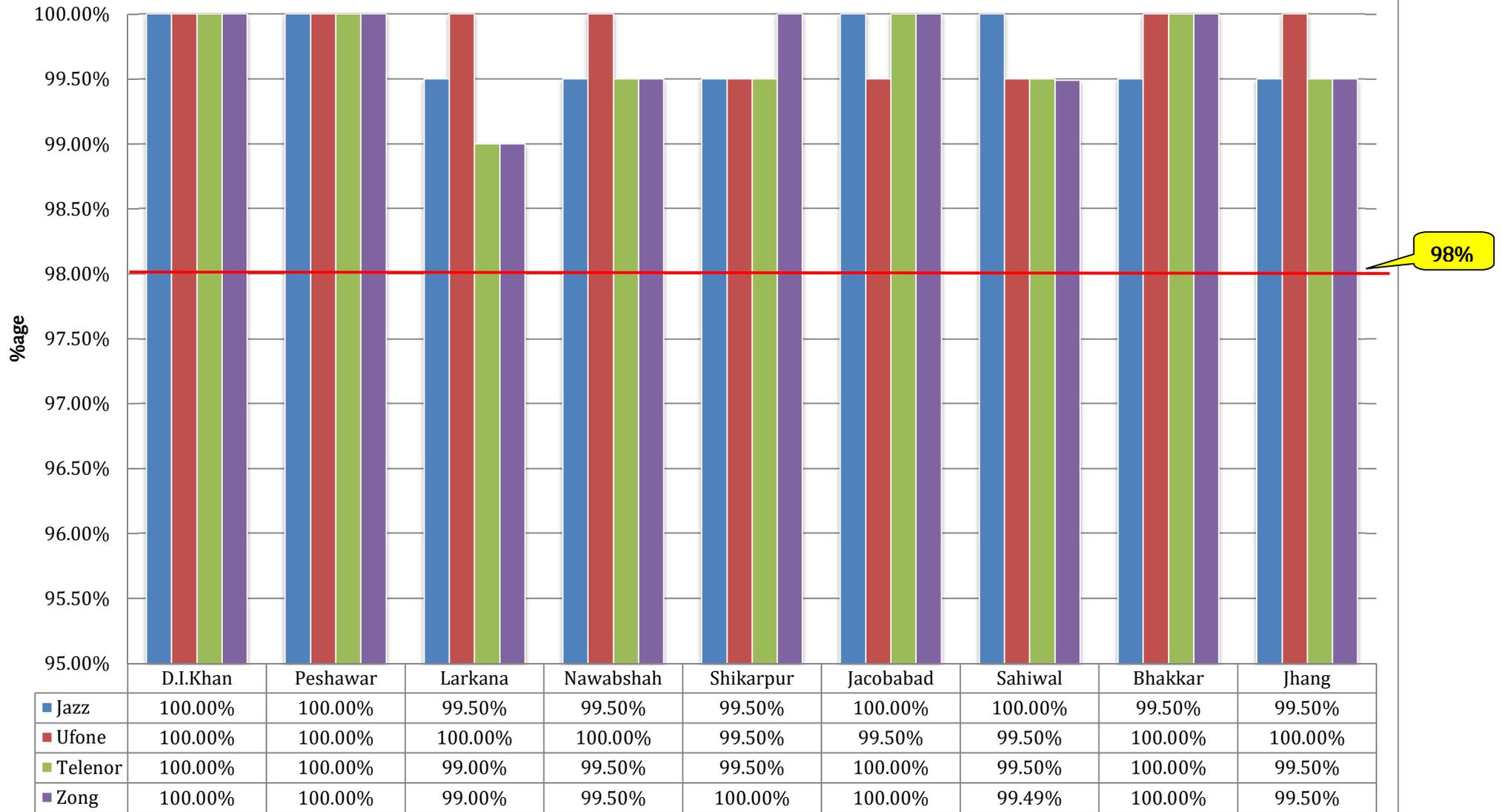
	D.I.Khan	Peshawar	Larkana	Nawabshah	Shikarpur	Jacobabad	Sahiwal	Bhakkar	Jhang
Jazz	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.90%
Ufone	100.00%	99.90%	100.00%	100.00%	100.00%	100.00%	99.90%	100.00%	100.00%
Telenor	99.90%	100.00%	100.00%	100.00%	100.00%	100.00%	99.90%	100.00%	100.00%
Zong	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Grade of Service - Citywise Results (Threshold: ≤ 2%)

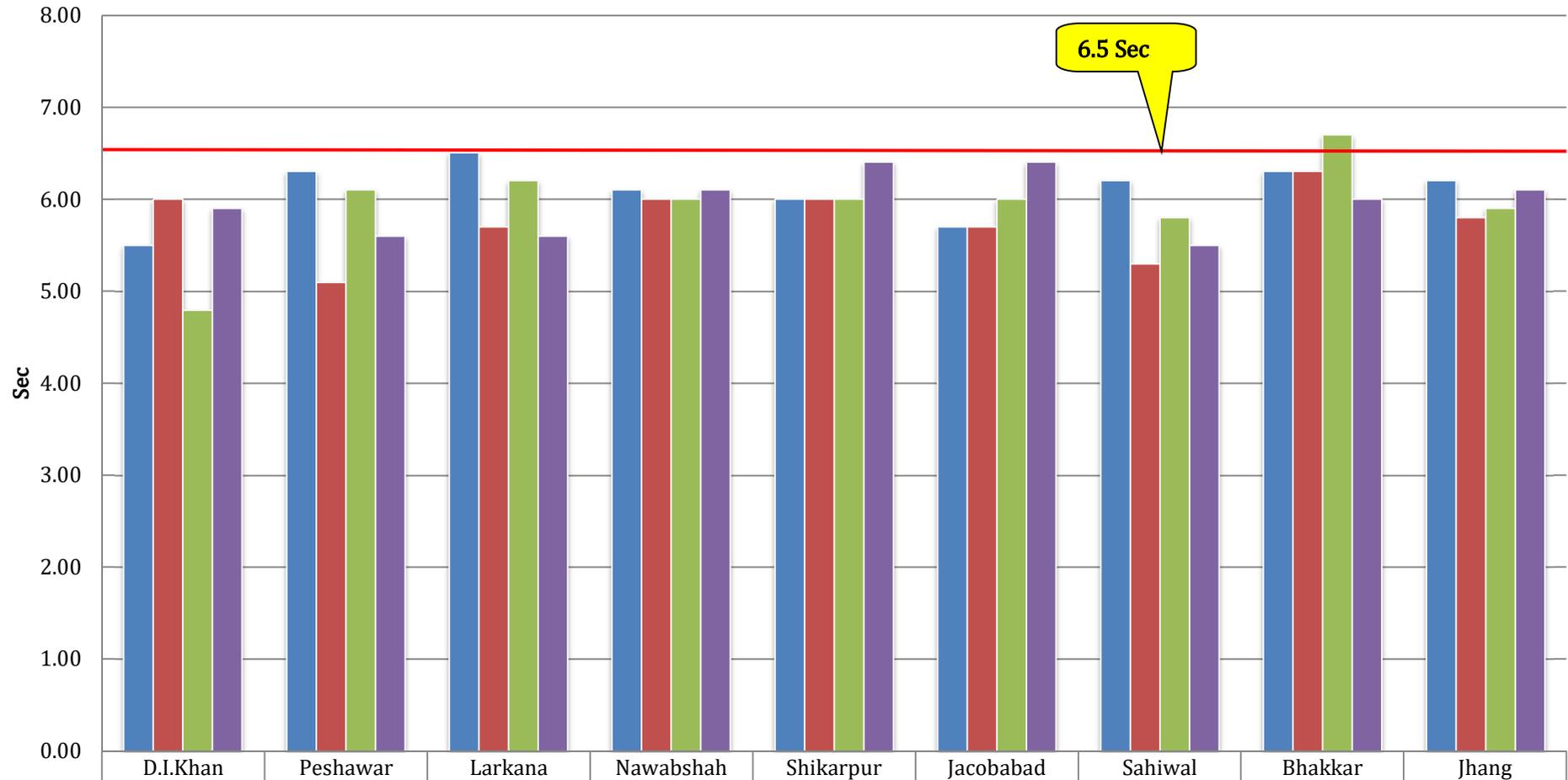


	D.I.Khan	Peshawar	Larkana	Nawabshah	Shikarpur	Jacobabad	Sahiwal	Bhakkar	Jhang
Jazz	0.00%	0.00%	0.50%	0.50%	0.50%	0.00%	0.00%	0.50%	0.50%
Ufone	0.00%	0.00%	0.00%	0.00%	0.50%	0.50%	0.50%	0.00%	0.00%
Telenor	0.00%	0.00%	1.00%	0.50%	0.50%	0.00%	0.50%	0.00%	0.50%
Zong	0.00%	0.00%	1.00%	0.50%	0.00%	0.00%	0.00%	0.00%	0.50%

Service Accessibility - Citywise Results (Threshold: > 98%)

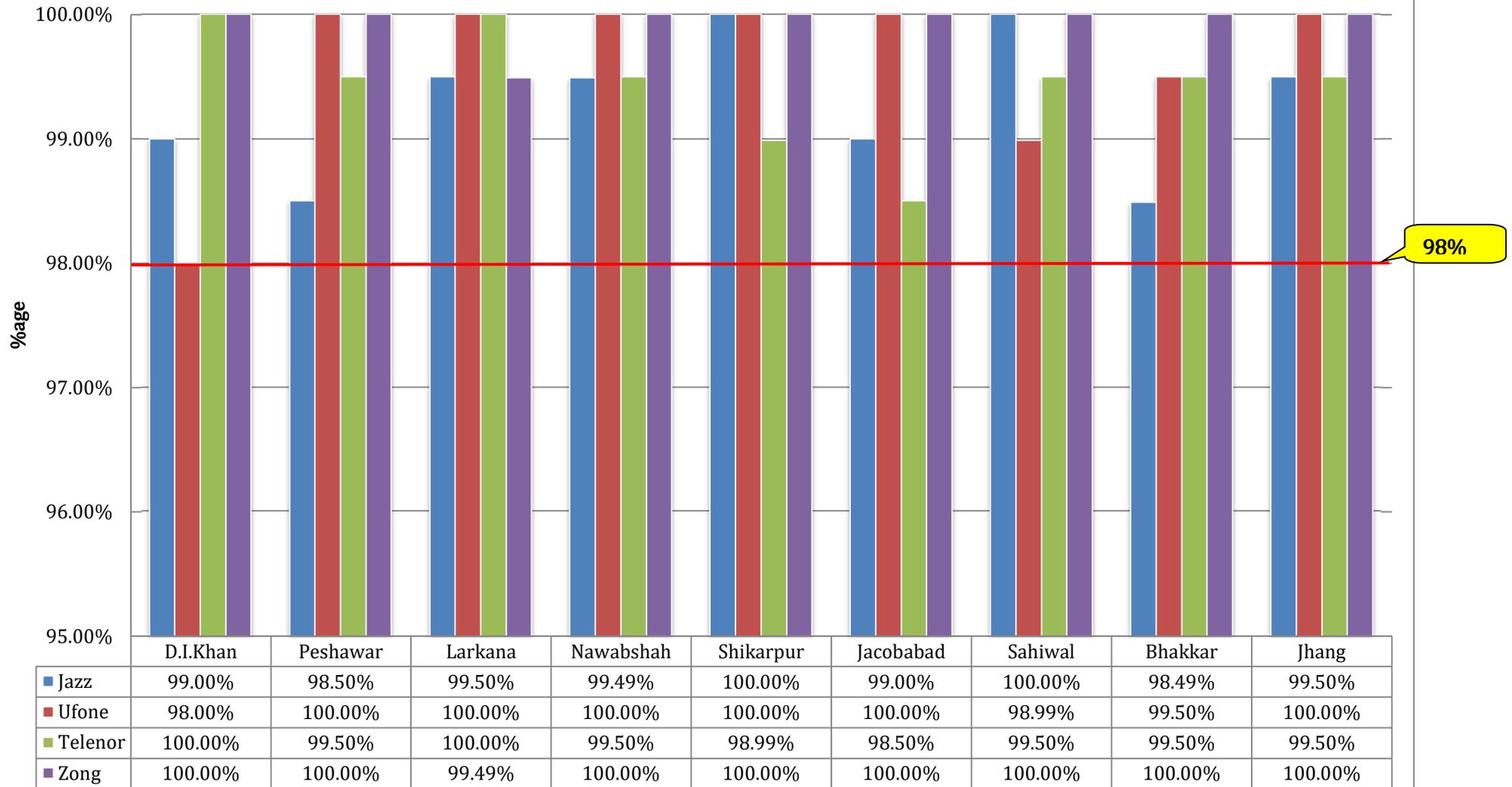


Call Connection Time - Citywise Results (Threshold: ≤ 6.5 Sec)

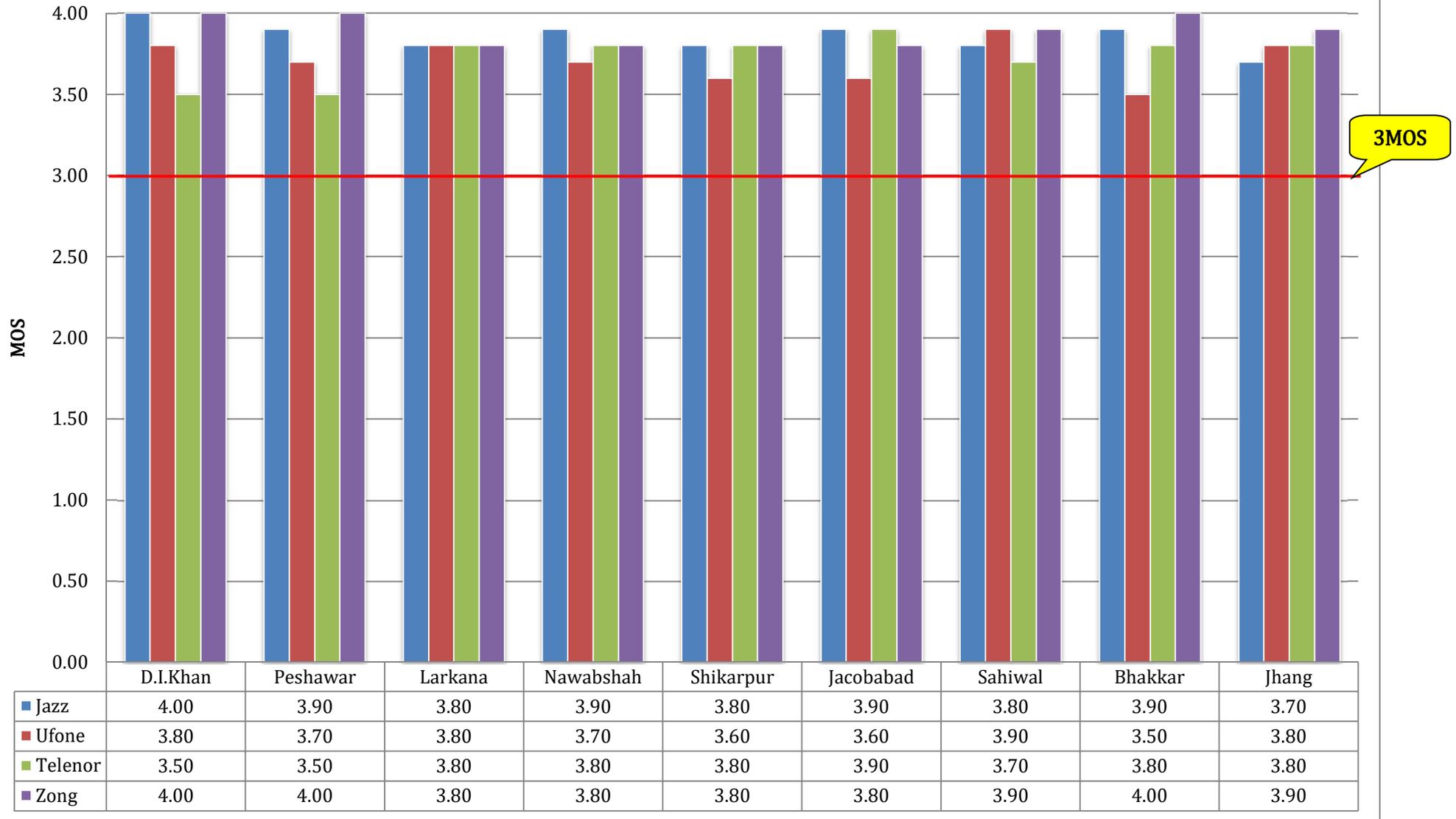


	D.I.Khan	Peshawar	Larkana	Nawabshah	Shikarpur	Jacobabad	Sahiwal	Bhakkar	Jhang
Jazz	5.50	6.30	6.50	6.10	6.00	5.70	6.20	6.30	6.20
Ufone	6.00	5.10	5.70	6.00	6.00	5.70	5.30	6.30	5.80
Telenor	4.80	6.10	6.20	6.00	6.00	6.00	5.80	6.70	5.90
Zong	5.90	5.60	5.60	6.10	6.40	6.40	5.50	6.00	6.10

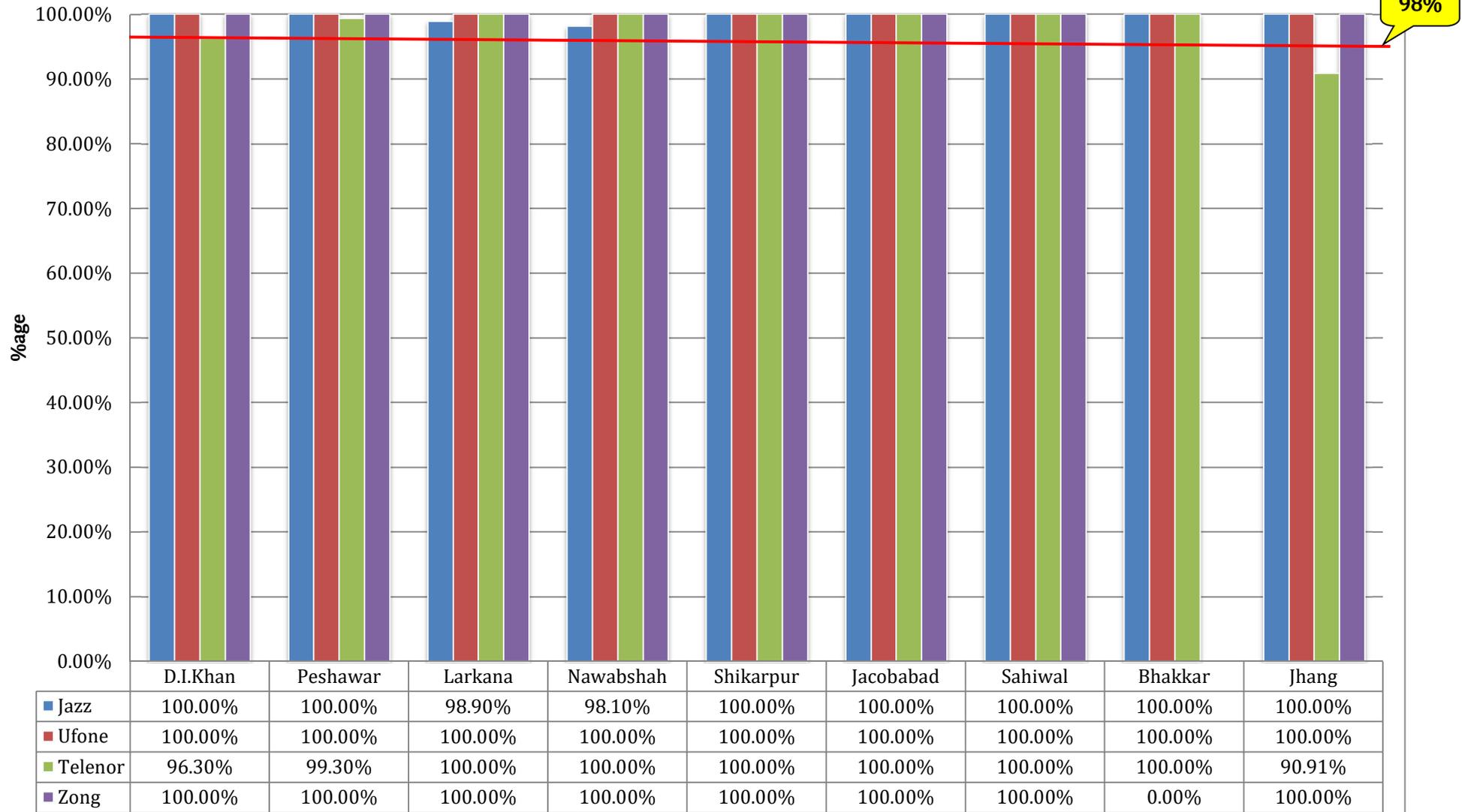
Call Completion Ratio - Citywise Results (Threshold: > 98%)



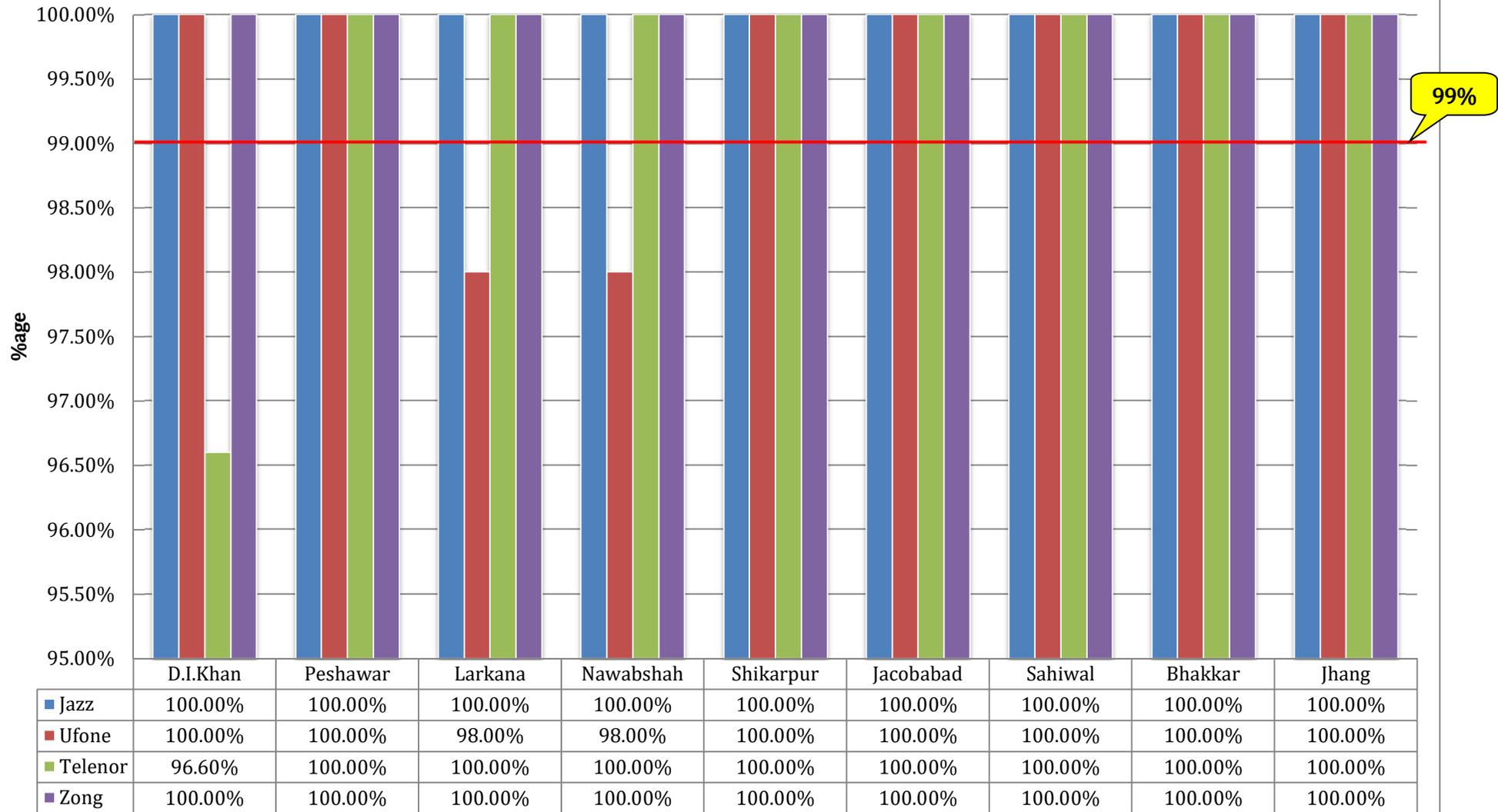
End to End Speech Quality - Citywise Results (Threshold: MOS ≥ 3)



Inter System Handover of CS Voice - Citywise Results (Threshold: $\geq 98\%$)



SMS Success Rate - Citywise Results (Threshold: > 99%)



SMS End to End Delivery Time - Citywise Results (Threshold: ≤ 12 Sec)

