Alqalam Journal of Medical and Applied Sciences. 2025;8(3):1387-1392
https://doi.org/10.54361/ajmas.258319

Original article

Epidemiological and Clinical Characteristics of COVID-19 Cases in Libya: A Cross-Sectional Analysis of Contact History, Symptomatology, and Demographic Risk

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Abstract
While COVID-19 epidemiology has been extensively studied globally, data from Libya remain limited. This study addresses this gap by examining demographic characteristics, contact patterns, and clinical presentations among confirmed cases in an urban Libyan population during the early pandemic period. A cross-sectional analysis was conducted of 4,708 individuals presenting to COVID-19 screening centers in Tajoura, Libya (May-December 2020). Data were extracted from national surveillance records, including demographics, self-reported symptoms, contact history, and RT-PCR results. Statistical analyses identified associations between exposure risks and test positivity using chi-square and t-tests. The cohort (mean age 37.4±17.3 years; 54.9% male) showed high contact exposure (90.7% overall), particularly among children (95.0%) and females (92.9% vs 89.0% males, p<0.001). Myalgia (87.8%), fatigue (10.2%), and anosmia/ageusia (7.6%) were the most prevalent symptoms. Anosmia (p<0.001) and headache (p=0.003) showed the strongest associations with PCR positivity. No age-based differences in test positivity were observed (p>0.05), contrasting with global trends. This first large-scale study from Libya reveals distinct transmission patterns, including exceptional myalgia reporting and demographic-specific exposure risks. Findings underscore the importance of context-specific surveillance in humanitarian settings to guide targeted interventions in future epidemics.
Keywords. COVID-19, Libya, Epidemiology, Symptoms, Contact Tracing.

Introduction

The COVID-19 pandemic, caused by SARS-CoV-2, has exhibited heterogeneous transmission dynamics and clinical presentations across populations, influenced by demographic, behavioral, and regional factors [1,2]. While global studies have characterized symptom prevalence and contact-based transmission [3,4], data from North Africa—particularly Libya—remain underrepresented in the literature. Understanding local epidemiological patterns is critical for tailoring public health interventions, especially in resource-limited settings [5]. Libya's first COVID-19 wave peaked in mid-2020, coinciding with fragile health infrastructure and limited testing capacity [6]. Studies from similar settings highlight the role of socio-demographic factors in transmission [7], but no large-scale analyses exist for Libyan populations. Despite the transition to endemicity, research on COVID-19 retains urgency due to unresolved scientific and public health challenges. Long-term sequelae affect an estimated 10–20% of survivors, with mechanisms and risk factors still poorly understood, especially in understudied regions like Africa [8,9].
Historical precedents, such as the 1918 influenza pandemic, demonstrate that post-crisis research yields critical insights for future preparedness [10]. Our study addresses critical knowledge gaps by analyzing one of the largest COVID-19 datasets available from Libya, focusing on cases reported in Tajoura Municipality, Tripoli. We aim to characterize the epidemiological and clinical features of the early pandemic in this region, with particular attention to contact history patterns—including demographic variations and temporal trends, symptom profiles associated with RT-PCR positivity, and demographic risk factors such as age, gender, and residency that influence exposure and testing outcomes. By examining these variables in an understudied North African context, this study contributes region-specific insights that can inform future outbreak responses and promote more equitable global health strategies.

Methods

This cross-sectional study analyzed data from 4,708 individuals presenting to the COVID-19 rapid response team in Tajoura Municipality in Tripoli-Libya, between May and December 2020. The study utilized an existing epidemiological database approved by the National Center for Disease Control. Demographic variables, including age, sex, residence, and nationality, were recorded, along with self-reported symptoms documented through both spontaneous patient reports and physician inquiry. To minimize potential bias, healthcare staff recording symptoms were blinded to participants' eventual RT-PCR results during data collection.
The primary exposure variable was contact history with confirmed or suspected COVID-19 cases, recorded as a binary (yes/no) measure. All participants underwent nasopharyngeal swab collection with analysis via reverse transcription-polymerase chain reaction (RT-PCR) testing.

***Received**: 09-05-2025 - **Accepted**: 08-07-2025 - **Published**: 15-07-2025*

Data analysis was performed using SPSS version 22, employing descriptive statistics to summarize participant characteristics and bivariate analyses (Chi-square tests for categorical variables; independent t-tests for continuous variables) to examine associations between contact history, symptom profile, and PCR status, with statistical significance set at $p<0.05$.

Results

The study population of 4,708 participants had a mean age of 37.4 years (SD±17.3) with 54.9% male representation. Age distribution showed 12.9% children (≤18 years), 46.5% young adults, 34.3% adults, and 6.3% elderly (>65 years), with only 0.2% being non-Libyan nationals. Contact history with confirmed or suspected COVID-19 cases was reported by 90.7% of participants overall (Table 1).

Table 1. Sociodemographic characteristics of study participants

Character	Frequency	Percentage
Age		
Children	605	12.9
Young Adults	2,189	46.5
Adults	1,617	34.3
Elderly	296	6.3
Sex		
Male	2,584	54.9
Female	2,124	45.1
Place of residence		
Tajoura	4,442	94.4
Outside Tajoura	266	5.6
Nationality		
Libyan	4,699	99.8
Non-Libyan	9	0.2
History of contact		
Yes	4,272	90.7
No	436	9.3
RT-PCR result		
Positive	950	20.2
Negative	3,758	79.8

With temporal analysis revealing peak exposure rates of 100% during the initial study months (May-August 2020) that gradually declined to 84.9% in September and 70.6% by December. The proportion of positive RT-PCR swabs peaked in October and was lowest in July and November, with an overall positivity rate of 20.2% (Figure 1).

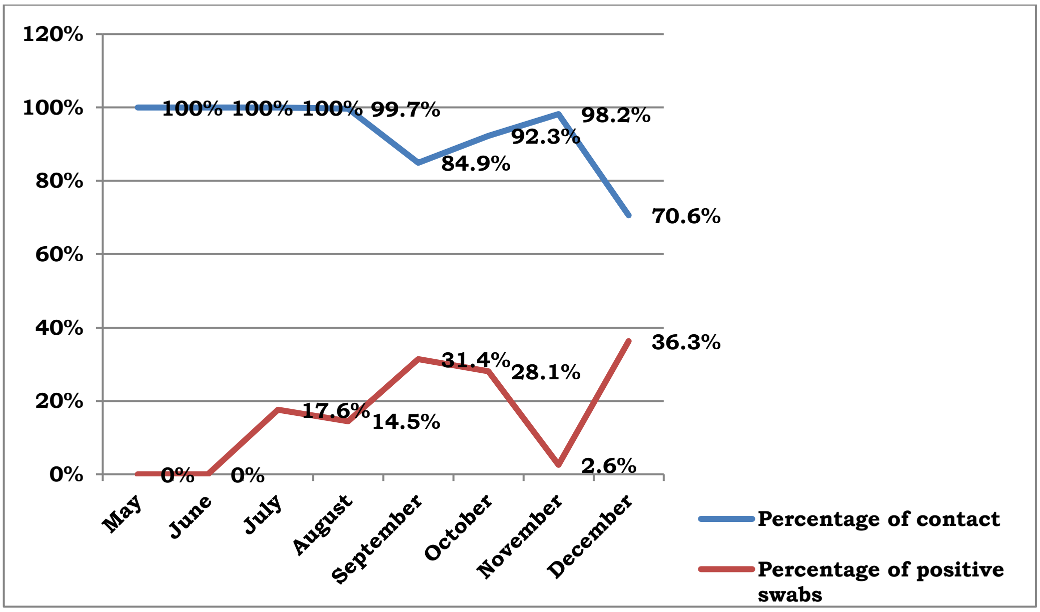

Figure 1. Percentage of contact and positive RT-PCR swabs

***Received**: 09-05-2025 - **Accepted**: 08-07-2025 - **Published**: 15-07-2025*

https://doi.org/10.54361/ajmas.258319

Symptomatic presentation was observed in 94.8% of attendees, with the most prevalent symptoms being myalgia (87.8%), fatigue (10.2%), fever (9.7%), cough (8.1%), and anosmia/ageusia (7.6%) (Figure 2).

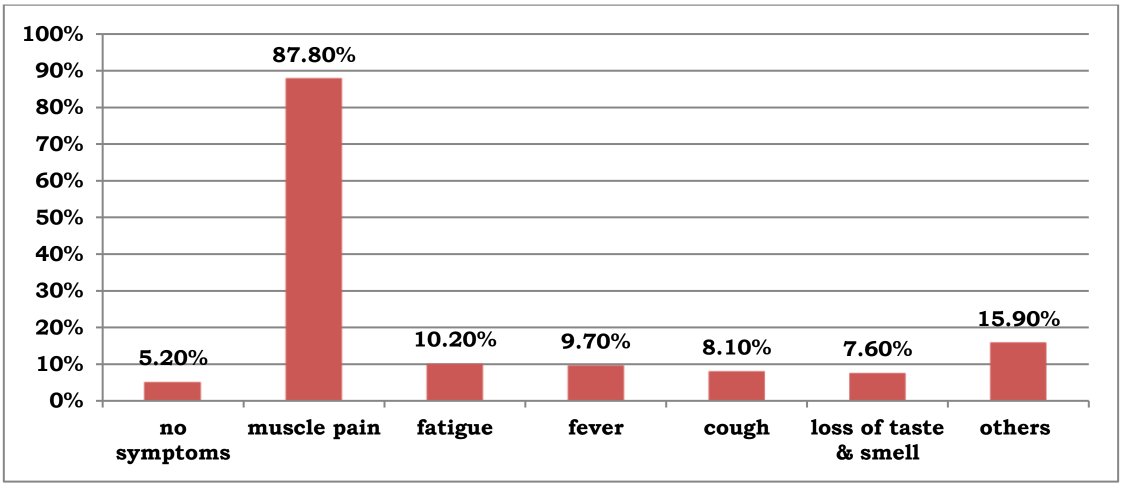

Figure 2. Distribution of participants by presenting symptoms

Subjects with a history of contact were, on average, one year younger than those without (p=0.528). Overall, 95% of children (≤18 years) reported contact exposure, compared to 89.3% of young adults and 92.6% of elderly individuals (p<0.0001). A positive contact history was significantly more common among females than males (92.9% vs. 89%, p<0.0001) and among residents of Tajoura (p<0.0001) (Table 2).

Table 2. Sociodemographic characteristics classified by the history of contact

Character	H/O contact n (%)	No H/O contact n (%)	P value
Age (mean±SD)	37.5±17.4	36.9±16.3	0.528
Age group			0.0001
Children	575(95%)	30(5%)	
Young Adult	1955(89.3%)	254(10.7%)	
Adult	1467(90.7%)	150(9.3%)	
Elderly	274(92.6%)	22(7.4%)	
Sex			0.0001
Male	2299(89%)	285(11%)	
Female	1973(92.9%)	151(7.1%)	
Place of residence			0.0001
Tajoura	4060(91.4%)	382(8.6%)	
Outside Tajoura	212(79.7%)	54(20.3%)	
Nationality			0.179
Libyan	4265(90.8%)	434(9.2%)	
Non-Libyan	7(77.8%)	2(22.2%)	

No statistically significant association was found between general characteristics (age, place of residence, and nationality) and RT-PCR results when comparing groups with or without a history of contact (p > 0.05). However, gender showed a significant difference: among subjects with a contact history who tested positive by RT-PCR, 52.6% were females compared to 47.4% males (p<0.0001) (Table 3).

Table 3. Characteristics of study participants stratified by contact history and RT-PCR results.

Character	H/O contact		P value	No H/O contact		P value
	RT-PCR (+)	RT-PCR (-)		RT-PCR (+)	RT-PCR (-)	
Age (mean±SD)	37.6±17.7	37.4±17.3	0.785	37.4±17.1	36.7±15.9	0.689
Age group			0.806			0.905
Children	115(14%)	460(13.3%)		9(6.9%)	21(6.9%)	
Young Adult	366(44.6%)	1589(46%)		71(54.6%)	163(53.3%)	
Adult	282(34.4%)	1185(34.3%)		45(34.6%)	105(34.3%)	
Elderly	57(7%)	217(6.3%)		5(3.8%)	17(5.6%)	
Sex			0.0001			0.381
Male	389(47.4%)	1910(55.3%)		81(62.3%)	204(66.7%)	
Female	431(52.6%)	1542(44.7%)		49(37.7%)	102(33.3%)	

***Received**: 09-05-2025 - **Accepted**: 08-07-2025 - **Published**: 15-07-2025*

Residence			0.327			0.152
Tajoura	785(95.7%)	3275(94.9%)		109(83.8%)	273(89.2%)	
Outside	35(4.3%)	177(5.1%)		21(16.2%)	33(10.8%)	
Nationality			0.741			0.088
Libyan	819(99.9%)	3446(99.8%)		128(98.5%)	306(100%)	
Non-Libyan	1(0.1%)	6(0.2%)		2(1.5%)	0(0%)	

Symptom profile significantly differed between SARS-CoV-2 RT-PCR positive and negative groups among contacts, with higher proportions of fatigue, fever, cough, anosmia, ageusia, sore throat, headache, and diarrhea in PCR-positive individuals ($p < 0.05$). No significant differences were observed for runny nose, dyspnea, vomiting, or abdominal pain. Among those without contact history, most symptoms showed no significant association with PCR status except for anosmia, ageusia, and headache ($p < 0.05$). Notably, while myalgia, fatigue, fever, cough, runny nose, sore throat, dyspnea, abdominal pain, vomiting, and diarrhea were more frequently reported in the PCR-positive group, these differences did not reach statistical significance (Table 4).

Table 4. Distribution of presenting symptoms stratified by history of COVID-19 contact and RT-PCR test results

Symptom	**H/O contact**		**P value**	**No H/O contact**		**P value**
	RT-PCR (+)	**RT-PCR (-)**		**RT-PCR (+)**	**RT-PCR (-)**	
Symptomatic	767(93.5%)	3322(96.2%)	0.001	120(92.3%)	255(83.3%)	0.015
Myalgia	671(81.1%)	3105(89.9%)	0.0001	107(82.3%)	251(82%)	0.944
Fatigue	126(15.4%)	337(9.8%)	0.0001	9(6.9%)	7(2.3%)	0.026
Fever	122(14.9%)	320(9.3%)	0.0001	7(5.4%)	7(2.3%)	0.133
Cough	97(11.8%)	271(7.9%)	0.0001	4(3.1%)	8(2.6%)	0.756
Anosmia and ageusia	157(19.1%)	182(5.3%)	0.0001	13(10%)	5(1.6%)	0.0001
Runny nose	32(3.9%)	108(3.1%)	0.275	3(2.3%)	5(1.6%)	0.632
Sore throat	43(5.2%)	100(2.9%)	0.002	5(3.8%)	7(2.3%)	0.353
Dyspnea	42(5.1%)	139(4%)	0.176	3(2.3%)	3(1.0%)	0.369
Headache	65(7.9%)	151(4.4%)	0.0001	10(7.7%)	2(0.7%)	0.0001
Vomiting	5(0.6%)	14(0.4%)	0.389	1(0.8%)	0(0%)	0.298
Diarrhea	9(1.1%)	15(0.4%)	0.034	1(0.8%)	1(0.3%)	0.508
Abdominal pain	3(0.4%)	6(0.2%)	0.387	0(0%)	0(0%)	-

Discussion

The findings of this study provide important insights into COVID-19 epidemiology in Libya, a region with limited published data despite experiencing significant pandemic impact. Our analysis of 4,708 cases in Tajoura reveals several notable patterns that both align with and diverge from global trends. The extremely high rate of reported contact exposure (90.7% overall) suggests intense community transmission during the study period, consistent with observations from other densely populated urban areas in low-resource settings [11,12]. The temporal decline in contact rates from 100% in early months to 70.6% by December 2020 may reflect either a true reduction in transmission or possible pandemic fatigue leading to underreporting of exposures [13]. This intensity of fatigue has been documented globally. One modeling study estimated that, in the absence of adherence fatigue, COVID-19 cases by December 2020 would have been approximately 47% lower, primarily due to sustained reductions in contact-related behaviors over time [14].

Symptom profile in our study showed both expected and unexpected patterns when compared to international data. While anosmia and headache demonstrated significant associations with PCR positivity - matching well-established COVID-19 symptom profile [15,16], the remarkably high prevalence of myalgia (87.8%) deserves particular attention, as it substantially exceeds rates reported in larger meta-analyses—including 17.5% overall, 36.7% in Europe, and 26.6% in North America [17], potentially reflecting differences in viral variants circulating in Libya during the study period, cultural variations in symptom reporting, or healthcare-seeking behaviors unique to this population. Such discrepancies highlight the importance of region-specific symptom surveillance to guide clinical diagnosis in resource-limited settings. Demographic analysis revealed several significant patterns with public health implications. The higher contact exposure rates among children (95%) and females (92.9%) likely reflect sociocultural factors including household structure and gender roles in caregiving, patterns observed in other Mediterranean populations: in Spain's Region of Murcia, household transmission accounted for over 56% of cases, with higher incidence among women than men**,** reflecting gendered caregiving roles and household dynamics [18]. Interestingly, while female gender was associated with both higher exposure risk and greater PCR positivity among exposed individuals, we found no significant age-based differences in test positivity—a notable contrast to data from higher-income countries where advanced age consistently emerges as a strong risk factor for infection [19].

***Received**: 09-05-2025 - **Accepted**: 08-07-2025 - **Published**: 15-07-2025*

In contrast, a large Pakistani cohort demonstrated that positivity rates were comparable across age groups among those tested [20], which potentially reflects Libya's younger demographics or age-related testing biases.

This study has several limitations that must be acknowledged. Reliance on self-reported symptoms and contact history introduces potential recall bias, though our use of physician verification may have mitigated this to some degree. As a single-site study conducted in an urban municipality, the findings may not fully represent rural populations or other regions of Libya. Additionally, RT-PCR testing limitations, including variable sensitivity and constrained testing capacity during the study period, may have affected case ascertainment.

Despite these limitations, this study makes important contributions to the understanding of COVID-19 epidemiology in North Africa. As future epidemics are likely to emerge under comparable constraints, the study's findings underscore the value of localized surveillance data to inform context-appropriate public health responses, particularly in regions affected by humanitarian crises and health system challenges. Future research should build on these findings by incorporating serological data to better characterize population immunity and investigating long-term outcomes among affected individuals.

Acknowledgments

The authors gratefully acknowledge the support provided by the COVID-19 Rapid Response Team in Tajoura Municipality, Tripoli, Libya.

Conflicts of Interest

The authors declare no conflicts of interest.

References

1. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72,314 cases from the Chinese Center for Disease Control and Prevention. JAMA. 2020;323(13):1239-42.
2. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. The New England Journal of Medicine. 2020;382:1199-207.
3. Menni C, Valdes AM, Freidin MB, Sudre CH, Nguyen LH, Drew DA, et al. Real-time tracking of self-reported symptoms to predict potential COVID-19. Nat Med. 2020;26(7):1037-40.
4. Pollán M, Pérez-Gómez B, Pastor-Barriuso R, Oteo J, Hernán MA, Pérez-Olmeda M, et al. Prevalence of SARS-CoV-2 in Spain (ENE-COVID): a nationwide, population-based seroepidemiological study. Lancet. 2020;396(10250):535-44.
5. Haider N, Osman AY, Gadzekpo A, Akipede GO, Asogun D, Ansumana R, et al. Lockdown measures in response to COVID-19 in nine sub-Saharan African countries. BMJ Glob Health. 2020;5(10):e003319.
6. Daw MA, El-Bouzedi AH, Ahmed MO, Alejenef AA. The epidemiological characteristics of COVID-19 in Libya during the ongoing-armed conflict. Pan Afr Med J. 2020 Nov 5;37:219. doi: 10.11604/pamj.2020.37.219.24993. PMID: 33520058; PMCID: PMC7821789.Mena GE, Martinez PP, Mahmud AS, et al. Socioeconomic status determines COVID-19 incidence in Santiago, Chile. Science. 2021;372:eabg5298.
7. Mena GE, Martinez PP, Mahmud AS, Marquet PA, Buckee CO, Santillana M. Socioeconomic status determines COVID-19 incidence and related mortality in Santiago, Chile. Science. 2021 May 28;372(6545):eabg5298. doi: 10.1126/science.abg5298.
8. Davis HE, McCorkell L, Vogel JM, Topol EJ. Long COVID: major findings, mechanisms and recommendations. Nat Rev Microbiol. 2023 Mar;21(3):133-146.
9. WHO. A clinical case definition for post COVID-19 condition in children and adolescents by expert consensus, 2023. Available from: https://www.who.int/publications/i/item/WHO-2019-nCoV-Post-COVID-19-condition-CA-Clinical-case-definition-2023-1
10. Taubenberger JK, Morens DM. 1918 Influenza: the mother of all pandemics. Emerg Infect Dis. 2006 Jan;12(1):15-22.
11. Millica Phiri et al. Observational study on the characteristics of COVID-19 transmission dynamics during the first wave of the epidemic in Lusaka, Zambia. Pan African Medical Journal. 2024;48:42. doi: 10.11604/pamj.2024.48.42.36724
12. Laxminarayan R, Wahl B, Dudala SR, Gopal K, Mohan B C, Neelima S, Jawahar Reddy KS, Radhakrishnan J, Lewnard JA. Epidemiology and transmission dynamics of COVID-19 in two Indian states. Science. 2020 Nov 6;370(6517):691-697. doi: 10.1126/science.abd7672.
13. Lilleholt L, Zettler I, Betsch C, Böhm R. Development and validation of the pandemic fatigue scale. Nat Commun. 2023 Oct 10;14(1):6352. doi: 10.1038/s41467-023-42063-2.
14. Rahmandad H, Lim TY, Sterman J. Behavioral dynamics of COVID-19: estimating underreporting, multiple waves, and adherence fatigue across 92 nations. Syst Dyn Rev. 2021 Jan-Mar;37(1):5-31. doi: 10.1002/sdr.1673.
15. Rocha-Filho PAS, Magalhães JE. Headache associated with COVID-19: Frequency, characteristics and association with anosmia and ageusia. Cephalalgia. 2020 Nov;40(13):1443-1451. doi: 10.1177/0333102420966770.
16. Saniasiaya J, Islam MA, Abdullah B. Prevalence of Olfactory Dysfunction in Coronavirus Disease 2019 (COVID-19): A Meta-analysis of 27,492 Patients. Laryngoscope. 2021 Apr;131(4):865-878. doi: 10.1002/lary.29286.

Received: *09-05-2025* - ***Accepted***: *08-07-2025* - ***Published***: *15-07-2025* *https://doi.org/10.54361/ajmas.258319*

17. Al Maqbali M, Al Badi K, Al Sinani M, Madkhali N, Dickens GL. Clinical Features of COVID-19 Patients in the First Year of Pandemic: A Systematic Review and Meta-Analysis. Biol Res Nurs. 2022 Apr;24(2):172-185. doi: 10.1177/10998004211055866.
18. Soriano López J, Salmerón Martínez D, García Pina R, Humberto Gómez J, Sánchez Rodríguez I, Ballesta Ruíz M, Chirlaque López MD. Características sociales y de género en el ámbito de contagio de COVID-19 en una región mediterránea [COVID-19 exposure setting, social and gender determinants in a mediterranean region. Rev Esp Salud Publica. 2022 Dec 19;96:e202212091. Spanish.
19. Pijls BG, Jolani S, Atherley A, Derckx RT, Dijkstra JIR, Franssen GHL, Hendriks S, Richters A, Venemans-Jellema A, Zalpuri S, Zeegers MP. Demographic risk factors for COVID-19 infection, severity, ICU admission and death: a meta-analysis of 59 studies. BMJ Open. 2021 Jan 11;11(1):e044640. doi: 10.1136/bmjopen-2020-044640.
20. Ghanchi, N.K., Masood, K.I., Qazi, M.F. *et al.* Disparities in age and gender-specific SARS-CoV-2 diagnostic testing trends: a retrospective study from Pakistan. *BMC Public Health* 24, 2629 (2024). https://doi.org/10.1186/s12889-024-19958-w

Received*: 09-05-2025 -* ***Accepted****: 08-07-2025 -* ***Published****: 15-07-2025*