

ORIGINAL ARTICLE

Performance Validation and Blood Donation Analysis in Nagqu, Tibet, One of the Highest Cities in the World

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SUMMARY

Background: Due to the unique geographical and climatic conditions in Nagqu (Tibet), the blood station laboratory was only fully established and accredited by 2020. This study validated the performance of the laboratory's blood screening system and analyzed recent trends in blood donation and screening effectiveness.

Methods: Various serum samples were used to assess the performance of hepatitis B, hepatitis C, HIV, and syphilis tests, both serological and nucleic acid tests. Donation data were also collected and analyzed.

Results: Serological testing demonstrated excellent sensitivity, specificity, and reproducibility (all 100%), with detection limits for HBsAg, HCV Ab, HIV-1 Ab, HIV-1 p24, and TP Ab of 0.2 IU/mL, 0.013 NCU/mL, 0.25 NCU/mL, 1.25 U/mL, and 1.5 mIU/mL, respectively. Nucleic acid testing systems also achieved 100% reproducibility with precision below 5%. PROBIT analysis revealed the 95% detection limits for HBV DNA, HCV RNA, and HIV-1 RNA as 8.29, 97.14, and 40.52 IU/mL, respectively. The study also found a high rate of unqualified donations for local markers such as ALT, HBsAg, syphilis, and HBV DNA.

Conclusions: The validation confirmed the screening system's high sensitivity, specificity, and reproducibility, highlighting the importance of effective pre-donation checks to ensure a safe blood supply in high-altitude areas. (Clin. Lab. 2025;71:xx-xx. DOI: 10.7754/Clin.Lab.2024.240814)

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Supplementary Data

Table S1. Number of donations and number (rate) of unqualified donations in Nagqu city.

Date	Donations	Serological test					NAT		
		ALT	HBsAg	Anti-HCV	Anti-HIV	Anti-TP	HBV-DNA	HCV-RNA	HIV-RNA
05/2022	76	2 (2.63%)	1 (1.32%)	0	0	1 (1.32%)	0	0	0
06/2022	119	1 (0.84%)	1 (0.84%)	0	0	1 (0.84%)	1 (0.84%)	0	0
07/2022	114	0	1 (0.88%)	0	0	0	2 (1.75%)	0	0
08/2022	35	3 (8.57%)	1 (2.86%)	0	0	0	1 (2.86%)	0	0
10/2022	17	0	0	0	0	0	0	0	0
11/2022	5	0	0	0	0	0	0	0	0
12/2022	52	0	0	0	0	2 (3.85%)	1 (1.92%)	0	0
01/2023	74	0	0	0	0	0	1 (1.35%)	0	0
02/2023	55	1 (1.82%)	0	0	0	0	0	0	0
03/2023	111	4 (3.60%)	2 (1.80%)	0	0	1 (0.90%)	1 (0.90%)	0	0
04/2023	49	2 (4.08%)	0	0	0	3 (6.12%)	1 (2.04%)	0	0
05/2023	69	1 (1.45%)	0	0	0	1 (1.45%)	0	0	0
06/2023	112	5 (4.46%)	1 (0.89%)	0	0	2 (1.79%)	2 (1.79%)	0	0
07/2023	74	0	0	0	1 (1.35%)	1 (1.35%)	0	0	1 (1.35%)
08/2023	95	2 (2.11%)	0	0	0	3 (3.16%)	0	0	0
09/2023	114	3 (2.63%)	0	0	0	0	0	0	0
10/2023	59	0	0	0	0	0	0	0	0
11/2023	59	4 (6.78%)	2 (3.39%)	0	0	0	1 (1.69%)	0	0
Total	1,289	28 (2.17%)*	9 (0.67%)*	0	1 (0.08%)	15 (1.15%)*	11 (0.84%)*	0	1 (0.08%)
National average rate (2022-2023)		0.71%	0.29%	0.12%	0.11%	0.29%	0.13%		

The data was collected from May 1, 2022, to November 30, 2023, and was accessed on December 2, 2023. No blood collection occurred in September 2022, so data for that month are omitted. χ^2 test was conducted on the test results of screening markers compared with the national average rates. *The difference was significant (p-value < 0.05).