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Research Article

Feline AB Blood Group in Household Cats in Mosul, Iraq

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ABSTRACT

Introduction: Feline AB blood typing is essential before transfusion because naturally occurring alloantibodies can cause severe incompatibility reactions. The present study aimed to describe the distribution of feline blood groups (A, B, and AB) among 100 household cats typed with the Sabervet® rapid immunochromatographic test in Mosul, Iraq.
Materials and methods: From May 2026 to September 2026, a total of 100 cats, Scottish Fold cats (n = 8), Himalayan cats (n = 10), Turkish Angora (n = 12), local-breed cats (n = 20), and Persian cats (n = 50), were presented to the Veterinary Hospital, University of Mosul, Mosul, Iraq. A total of 1 mL of blood was collected from the cephalic vein of each cat, placed in an EDTA tube, and blood-typed using a Sabervet® rapid immunochromatographic kit.
Results: The present results revealed that blood type A was identified in 81 cats (81.0%), blood type B in 16 cats (16.0%), and blood type AB in 3 cats (3.0%). Blood type A was the most frequent in each breed category, and the frequencies of the three blood types differed significantly. No significant association was found between reported breed and blood type.
Conclusion: The present findings, among the first to examine local cats in Iraq, characterized the distribution of blood groups and supported routine pretransfusion blood typing.

1. Introduction

The feline AB blood group system plays a key role in transfusion medicine and breeding management[1,2]. Cats possess naturally occurring alloantibodies against incompatible erythrocyte antigens; consequently, an incompatible first transfusion can cause acute, clinically severe reactions[3]. In domestic cats, there are three phenotypes, A, B, and AB[1,2]. These phenotypes are mainly controlled by allelic variation in the cytidine monophospho-N-acetylneuraminic acid hydroxylase (CMAH) gene, which determines the type of sialic acid on the erythrocyte membrane[4,5].

The frequency of feline blood groups varies between geographic populations and breeds[6,7,8]. Blood type A predominates in many non-pedigree populations, whereas type B occurs more often in particular pedigree populations; type AB is generally uncommon[9,10,11]. Geographic and breed-related differences influence the risk of transfusion incompatibility within a given clinical population. Cats with blood type B usually have strong anti-A alloantibodies, and incompatible exposure to type A erythrocytes can result in severe haemolysis[3,12]. Furthermore, maternal alloantibodies may cause neonatal isoerythrolysis when an at-risk queen and kittens have incompatible blood types[3,12].

Pretransfusion typing is therefore a primary safeguard, but it does not replace crossmatching test[13-15]. Crossmatching can reveal incompatibilities that the AB system alone cannot explain, including reactions that may involve other erythrocyte antigens[15,16]. Reliable typing is particularly important in emergency care, anemia management, surgical planning, donor screening, and

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breeding programs[13,17]. A locally generated description of blood-group frequencies can help clinicians anticipate the availability of compatible donors while recognizing that each individual animal should be tested[13,18].

Tube agglutination, card agglutination, gel techniques, and immunochromatographic devices have been used for feline blood typing[18-20]. Rapid immunochromatographic tests are advantageous because they provide practical results within a clinical workflow. The Sabervet® kit is a commercially available rapid immunochromatographic assay for feline blood typing, and its performance depends on adherence to the manufacturer's instructions regarding sample type, incubation time, and interpretation of the result bands[21]. No published data are available on the distribution of feline AB blood groups in Mosul or elsewhere in Iraq. Consequently, clinicians in the region relied on data from other countries when selecting donors and assessing the risk of transfusion incompatibility. The present study addresses this gap by reporting local baseline frequencies of blood types A, B, and AB in household cats of different breeds, which may assist donor screening and transfusion planning. The present study is one of the first to describe the distribution of blood types A, B, and AB among household cats in Mosul, Iraq, and aimed to examine whether this blood type distribution differed among reported cat breeds.

2. Materials and Methods

2.1. Ethical approval

The present study was approved by the Veterinary Medical Research Ethics Committee, College of Veterinary Medicine, University of Mosul, Mosul, Iraq (Approval No. UM, VET, 2026, 093). Before the experimental trial, the owners were informed about the study and gave their formal consent.

2.2. Animals and sample collection

The aggregate dataset included 100 cats, comprising Scottish Fold cats (n = 8), Himalayan cats (n = 10), Turkish Angora (n = 12), local-breed cats (n = 20), and Persian cats (n = 50), with the mean weights of the cats ranging from 2.5 to 7kg. The cats were 1.5–3 years old, with 58 males and 42 females, and were clinically healthy. All were client-owned household cats presented to the Veterinary Hospital, University of Mosul, Mosul, Iraq. Clinicians relied on data from other countries to select donors and assess the risk of transfusion incompatibility in this experiment, as there were no published articles from Mosul, Iraq, related to the objective of the present study.

A total of 1 mL of blood was collected from the cephalic vein of non-fasted cats using a 22-gauge needle. The samples were then placed in EDTA tubes and analyzed immediately after collection. The study period extended from May 2026 to September 2026.

2.3. Blood typing

Cats' blood groups were identified using the Sabervet® feline blood typing rapid test (Hangzhou ITGen Technology Co., Ltd., China) following the manufacturer's instructions. Briefly, 10 µL of whole blood was collected by capillary action using the kit's sampling tube and mixed well with the extraction buffer in the prefilled extraction tube. Three drops of the resulting mixture were then added to the sample well of the test cassette. The results were read at 10 minutes, and no cassette was read after 15 minutes. The test was accepted as valid only when the control line was visible. Cats were classified as type A when the C and A lines were observed, type B when the C and B lines were observed, and type AB when the C, A, and B lines were observed. A cassette showing only the C line was considered invalid, and the test was repeated using a new cassette. The manufacturer reported a diagnostic sensitivity of 98.0% and a specificity of 97.5% for the blood group test[21].

2.4. Statistical analysis

Blood type results were expressed as counts and percentages. Two-sided 95% confidence intervals (CIs) for the observed blood group proportions were calculated using the Wilson score method[22]. Frequencies of the three blood types were compared using a chi-square goodness-of-fit test (equal expected proportions) and subsequent pairwise two-sided exact binomial tests with Holm adjustment. Breed- or source-specific results were presented as counts and row percentages. For instance, in the 5 × 3 breed-by-blood-type table, expected counts were <5 in 9 (60%) of the 15 cells, including all 5 type AB cells, so the conventional Pearson chi-square approximation was not used as the primary comparison. Instead, the global association between reported breed or source category and blood type was evaluated using an R × C Fisher-Freeman-Halton exact test with Monte Carlo estimation based on 99,999 resamples and a fixed random seed[23]. Differences were considered statistically significant at $p < 0.05$ using the two-sided test.

3. Results

Blood typing was recorded for 100 household cats. Type A was the predominant blood group, identified in 81 cats (81.0%, 95% CI: 72.2-87.5%). Type B was identified in 16 cats (16.0%, 95% CI: 10.1-24.4%), whereas type AB was identified in 3 cats (3.0%, 95% CI: 1.0-8.5%). Thus, type AB was the least frequently observed blood group in the 100 cats (Figure 1; Table 1). The frequencies of the three blood groups differed significantly ($p < 0.05$, $\chi^2 = 104.8$, df = 2). Pairwise comparisons with Holm adjustment demonstrated that all three pairs differed significantly. Blood type A differed significantly from blood type B ($p < 0.001$), blood type A differed significantly from blood type AB ($p < 0.001$), and blood type B differed significantly from blood type AB ($p < 0.004$).

The study population included 50 Persian cats, 20 local breed cats, 12 Turkish Angora cats, 10 Himalayan cats, and 8 Scottish Fold cats. Type A was the most frequent blood group in all breeds, with 43 Persian cats (86.0%), 15 local-breed cats (75.0%), 9 Turkish Angora cats (75.0%), 8 Himalayan cats (80.0%), and 6 Scottish Fold cats (75.0%). Six Persian, four local-breed, three Turkish Angora, two Himalayan, and one

Scottish Fold cat were typed as B. Type AB was only found in three cats, one each from the Scottish Fold, local-breed, and Persian cats (Table 2). No significant association between breed category and blood type was observed (Fisher-Freeman-Halton exact test; p = 0.62).

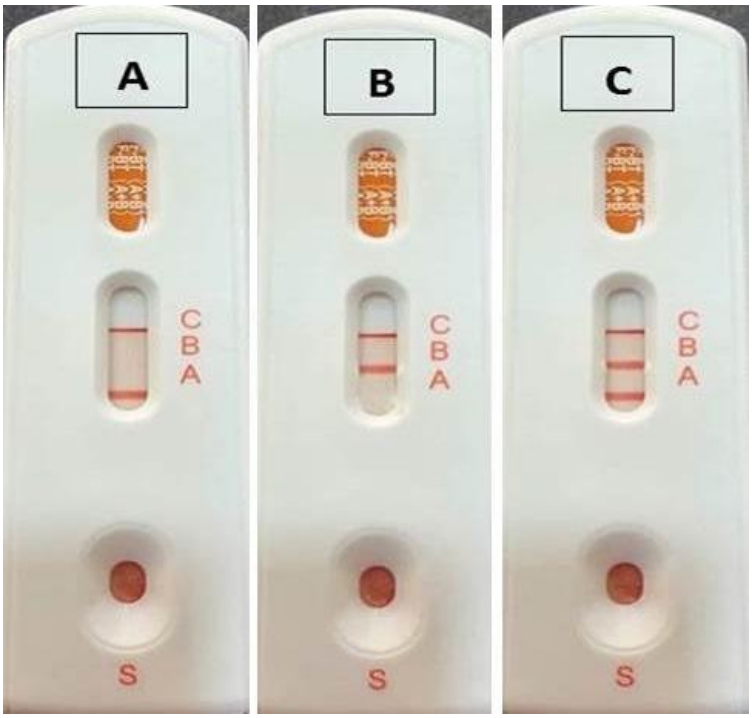


Figure 1. Feline blood grouping results using the Sabervet® rapid feline blood typing test in Mosul, Iraq. **A**: Blood type A; the A and control (C) bands were visible. **B:** Blood type B; the B and C bands were visible. **C:** Blood type AB; the A, B, and C bands were visible.

Table 1. Feline AB blood group distribution among 100 household cats from Mosul, Iraq, tested using the Sabervet® rapid immunochromatographic test

Blood types	Number of cats	Observed frequency (%)	95% CI (%)
A	81	81.0[a]	72.2–87.5
B	16	16.0[b]	10.1–24.4
AB	3	3.0[c]	1.0–8.5
Total	100	100.0	—

[a,b,c] Mean different superscript letters are significantly different in a column at $p < 0.05$.

Table 2. Feline AB blood group distribution by breed among 100 household cats in Mosul, Iraq

Breed	Total number of cats	Number of cats with blood type A (%)	Number of cats with blood type B (%)	Number of cats with blood type AB (%)
Scottish Fold	8	6 (75.0%)[a]	1 (12.5%)[a]	1 (12.5%)[a]
Himalayan	10	8 (80.0%)[a]	2 (20.0%)[a]	0 (0.0%)[a]
Turkish Angora	12	9 (75.0%)[a]	3 (25%)[a]	0 (0.0%)[a]
Local-breed cats	20	15 (75.0%)[a]	4 (20.0%)[a]	1 (5.0%)[a]
Persian cats	50	43 (86.0%)[a]	6 (12.0%)[a]	1 (2.0%)[a]
Total	100	81 (81.0%)	16 (16.0%)	3 (3.0%)

[a] Mean different superscript letters are significantly different in a column at $p < 0.05$.

4. Discussion

Among 100 household cats in Mosul, Iraq, type A was most common (81.0%), followed by type B (16,0%) and type AB (3.0%). This overall pattern was consistent with reports from numerous feline populations in which type A predominated and type AB was rare, including non-pedigree cats in Beijing, China[8], Saskatchewan and Alberta, Canada[9], Central Italy[10], and New Zealand[11]. However, the frequency of each group can vary substantially by country, breed composition, and recruitment setting[6,7]. The present results should be interpreted as a description of the cats available for the study rather than as an estimate of blood-group prevalence for all cats in Mosul, Iraq. Type B occurred with a frequency of 16.0%, which was clinically relevant because cats with blood type B typically have remarkable levels of naturally occurring anti-A alloantibodies and are at risk for severe, potentially life-threatening reactions when they receive type A blood[3,13,14]. Type AB was identified in only three cats, with a wide interval reflecting uncertainty

in its local frequency, suggesting that type AB donors are likely rare in the local cat population.

Type A was the most common blood group in all five breed categories, indicating that breed was not associated with blood type in the present study. However, previous studies reported a higher frequency of blood type B in several pedigree breeds than in non-pedigree cats[1,6]. Additionally, a genetic survey of more than 11,000 cats documented breed-related differences in blood-type frequencies[17]. Thus, the absence of a breed effect in the present findings may be attributable to the small sample sizes in several breed groups (8-12 cats), which may have limited the ability to detect differences, rather than indicating a genuine absence of breed-related variation. Breed and origin are useful descriptors because earlier studies found differences between pedigree and non-pedigree cat populations[6,7,17]. For instance, only 3.2% of the 63 domestic shorthair cats in Isfahan, Iran, were type B, 96.8% were type A, and none were type AB[24]. Moreover, 3.5% of the 1070 purebred and non-purebred cats from Portugal and Spain were type B, 96.5% were type A, and no cats were type AB[7]. Both studies reported lower frequencies than the 16.0% reported in the present study. The present study reported blood group data from the Mosul region, Iraq. Because 80% of the cats in the present study belonged to pedigree breeds, these reports supported the interpretation that the higher frequency of type B in this study was associated with its breed composition, although this relationship could not be tested directly. Nevertheless, breed alone should not be used to infer an individual cat's blood type.

Comparisons with other populations should be interpreted descriptively, as population composition and typing methods differed among the studies. Type A was predominant in each of the following studies; however, blood type B in the present study (16.0%) was higher than that reported in Isfahan, Iran (3.2%)[24], Luanda, Angola (5.1%; no type AB)[25], Bangkok, Thailand (3.51%)[26], Kyiv, Ukraine (10.4%)[27], and a multicountry study (9.6%)[28]. The prevalence of type AB in the current study (3.0%) was comparable to that reported in Bangkok, Thailand (1.75%)[26], Kyiv, Ukraine (2.7%)[27], and the multicountry study (2.8%)[28], whereas no type AB cats were identified in Isfahan, Iran[24] or Luanda, Angola[25]. In contrast, a study of cats in the Montreal area of Quebec, Canada, reported 94.4% type A, 5.0% type B and 0.6% type AB, which were markedly different from the frequencies observed in the present study (81.0% type A, 16.0% type B and 3.0% type AB)[29]. Such distributions are useful for estimating the population-level risk of incompatible transfusion and neonatal isoerythrolysis[30]. A rapid, in-clinic immunochromatographic assay enables results to be obtained during the clinical assessment. However, blood typing should be accompanied by crossmatching and appropriate transfusion practices when blood transfusion is administered[13-15]. Because this study used a rapid test to check only the AB blood group system, the reported blood types did not exclude incompatibilities involving other red blood cell antigens, such as feline erythrocyte antigen 6 (FEA 6)[31,32] or mismatches between phenotype and genotype[33]. Crossmatching therefore serves as an important additional safeguard before transfusion[13,34]. Acute transfusion reactions is clinically relevant in cats[35], and current guidelines emphasized the importance of blood typing and crossmatching to improve compatibility[13,34].

5. Conclusion

Among 100 household cats examined in Mosul, Iraq, type A was the most common blood type (81.0%), followed by type B (16.0%) and type AB (3.0%). Type A was the most frequent blood type in every reported breed. No statistically significant association between breed and blood type was detected. The high observed frequency of blood type A and the presence of clinically important type B and AB suggested that routine blood typing before feline transfusion is advisable. The present study had several limitations. Some breed groups included few cats, and only one rapid test was used. The test was not compared with a reference method or crossmatching, so its diagnostic accuracy could not be assessed. Future studies should use consecutive sampling, pre-defined eligibility criteria, complete individual level data, documented kit-lot and quality control procedures and an appropriate reference method.

Declarations

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Authors' contributions

Qaes Al-Obaidi was responsible for conceptualization, methodology, formal analysis, investigation, writing of the original draft, and supervision. Amer Taha performed validation and data curation. Mohammad Al-Taliby and Sadam Hassan performed the sample collection, blood typing, and clinical investigations. Wasan Alobaidii and Safwan Albaroodi reviewed and edited the manuscript. Furthermore, all authors have read and approved the final edition of the manuscript.

Availability of data and materials

All datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

Ethical considerations

All ethical protocols, including plagiarism, misconduct, duplication, and data fabrication, were checked by the authors. The authors certify that the originality of the study has been verified and that it has not been submitted elsewhere for publication. The authors declare and take full responsibility for the originality of the article's content before submission and after acceptance. During the writing

of this manuscript, the QuillBot AI tool was used to assist with language editing, sentence rephrasing, manuscript organization, reference checking, and formatting. It was not utilized to produce experimental data, fabricate results, or replace the authors' scientific judgment. The authors take full responsibility for the final submitted edition and have examined and validated all AI-assisted content, references, and interpretations.

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