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The Relationship between Blood Type and Cutaneous Leishmaniasis in Iran (A Review)

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ABSTRACT

Introduction: Cutaneous leishmaniasis is one of the health concerns in Iran. Numerous studies have examined the role of blood type in people with the disease. Therefore, this study aimed to investigate the prevalence of leishmaniasis in different blood groups as a review in Iran.

Materials and Methods: For this review, two researchers evaluated the extracted articles in terms of relevance to the purpose of the study after searching four databases, including Scopus, Web of Science, PubMed, and Science Direct. Literature reports on the prevalence of leishmaniasis in different blood groups in Iran until the end of March 2021. Relevant information included study time, study tool, number of subjects, mean age, and the relationship between blood type and infection which were recorded in Excel form.

Results: After searching, screening, and qualitative evaluation of the studies, out of 135 identified articles, five papers met the required requirements. These five articles were published from 1999 to 2012, three studies examined the relationship between cutaneous leishmaniasis with different age groups. Also, three studies experimentally evaluated the relationship between cutaneous leishmaniasis with different human blood groups.

Conclusion: According to the results of the present review, cutaneous leishmaniasis is more common in some blood groups. Studies have shown that Rh-negative blood groups with B alleles are more affected by cutaneous leishmaniasis than others; however, more studies are required.

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Introduction

Leishmaniasis is identified by the World Health Organization (WHO) as one of the six major infectious diseases among human and animal parasitic diseases [1, 2]. This disease is an important health problem in many parts of the world, especially in developing countries, and threatened 350 million people in 98 countries worldwide [3]. Every year more than 2 million people become infected with leishmaniasis in its three forms of cutaneous, mucosal, and visceral skin [4]. Leishmaniasis with 1.5 million cases has

the highest incidence followed by visceral leishmaniasis. However, leishmaniasis mucosal is very rare. It is estimated that 500,000 deaths annually are due to this disease worldwide [5-7]. According to global statistics, Middle Eastern countries, such as Afghanistan, Iran, Saudi Arabia, and Syria, as well as several South American countries, such as Peru and Brazil, count for about 90% of the world's cutaneous leishmaniasis [5, 8]. In Iran, cutaneous leishmaniasis, as the most common clinical form of leishmaniasis, has been reported in both urban and rural epidemiological forms [4]. The causative agent of the urban-type (dry) is Leishmania Tropica and the main carrier is Phlebotomus sergenti, which are the foci of this form of the disease in Iran, including Mashhad, Tehran, Neishabour, Shiraz, Bam, and Kerman [9, 10]. The causative agent of the disease in the rural (wet) type is Leishmania major and the main carrier is phlebotomus papatasi [11]. Rural seeker centers in Iran includ Isfahan, Khuzestan, Khorasan, and Fars [12-15]. In addition to the high prevalence of leishmaniasis worldwide [16], the bitter consequences of this disease, such as the impact on the appearance of the patients, especially in open areas of the body, such as face and hands [10, 17, 18], long treatment process, and secondary fungal or bacterial wound infections [19-21] necessitate studying different prevention methods.

Therefore, studying the activity and function of sandflies in selecting and preferring the type of host and eating place has been considered by researchers. Sandflies use chemical and olfactory signs and attractions, such as carbon dioxide concentration, etc. [9]. Moreover, blood groups and Rh factors are considered as one of the most important factors associated with many infectious diseases, such as leishmaniasis. Studies reported in recent decades support this claim [22-25]. Greenblatt et al. hypothesized that Leishmania parasite might use a camouflage system that mimics host blood group antigens to attack host defense mechanisms in humans [26].

Therefore, due to the importance of the subject, study of the relationship between cutaneous leishmaniasis and blood groups in Iranian studies is necessary to be used in preventive programs. Consequently, this review aimed to survey the relationship between cutaneous leishmaniasis in different blood groups in Iran.

Materials and Methods

Initially, the main question of the study was whether or not the cutaneous leishmaniasis is related to the blood groups in Iran. Thus, the main purpose of this study was to investigate the relationship of cutaneous leishmaniasis in different blood groups in Iran. This study reviewed the topic of the prevalence of leishmaniasis in different blood groups. First, the keywords were identified to search for articles related to the main topic. The strategy of search was as follows:

("Leishmaniosis" OR "cutaneous leishmanial") AND ("Blood Groups" OR "Blood Type" OR "blood group type") AND ("IRAN" OR "Persian"). Regarding the research field, four closely related databases, including Scopus, Web of Science, PubMed, and Science Direct, were searched based on keywords.

The results of this review were collected based on articles conducted in domestic and foreign journals in different cities of Iran and indexed in databases until March 2021. There were no restrictions on the language of selected articles. Therefore, the articles were selected in Persian and English.

In the second step, repeated and out-of-study cases were excluded from the study after the initial screening. In the next step, re-screening was performed by studying the title and abstract of all articles that had a complete review of the subject and the keywords mentioned in them, and the initial list of articles was prepared.

The inclusion and exclusion criteria: The study included articles that measured the prevalence of cutaneous leishmaniasis in human blood groups in different regions of Iran and published specific values in reputable journals in the database. Articles that did not express clear results and findings on the relationship of

cutaneous leishmaniasis with different blood groups or measured cutaneous leishmaniasis in the animal blood group were excluded from the study. Articles examining the association between blood type and visceral leishmaniasis and articles that studied this relationship exclusively on animals were also excluded.

Evaluation of the study quality was performed using CASP modified quality evaluation checklists for descriptive/cross-sectional studies. This checklist is a standard and widely used tool for evaluating articles. The modified checklist consisted of 18 items and each item was assigned a score of one (including that item in the article) or zero (not paying attention to the item in the article) [27].

Data analysis

After searching and extracting the data, the articles were prepared for final evaluation based on the required information, including place of study, year of study, study tool, number of the subjects, mean age (year), and the prevalence among blood groups (Table 1).

According to figure 1, during these steps, a total of 135 articles were reviewed by the end of 2021. Five articles were defined to use in this review.

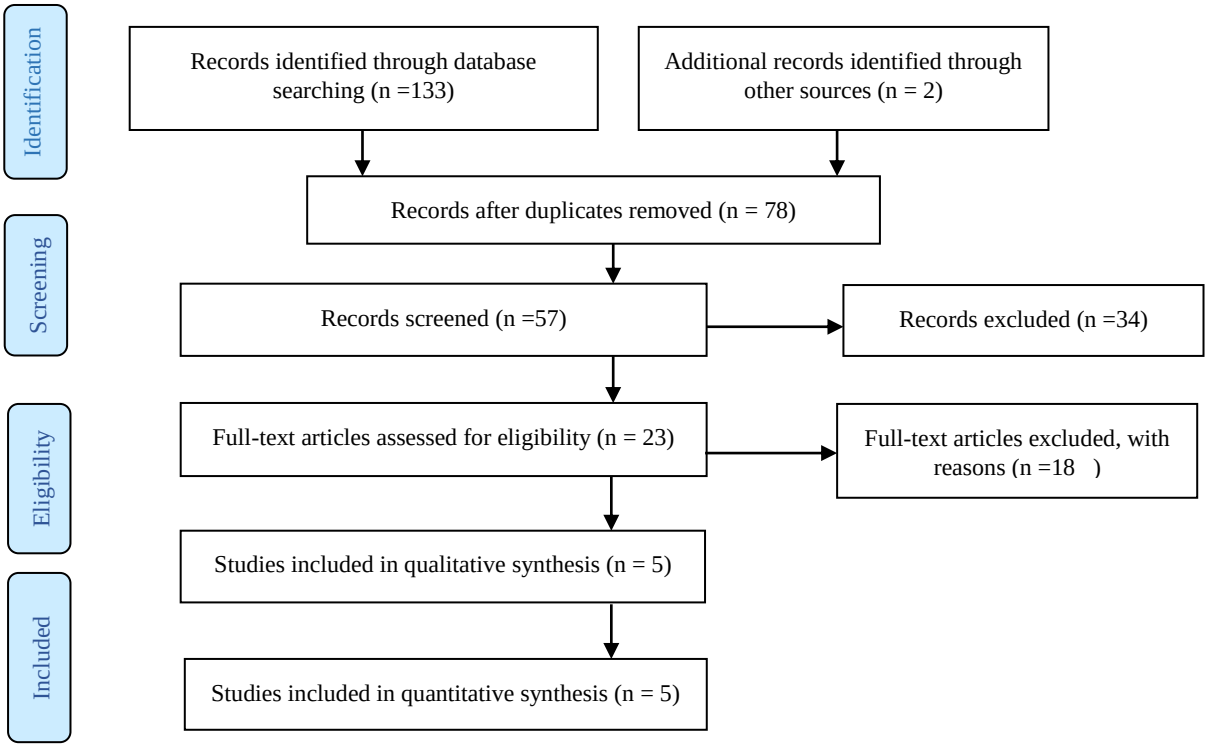

Figure 1: A flow diagram of literature screening

Results

In this review, after searching, screening, and qualitative evaluation of studies, five articles were selected for further review. One of the articles was excluded from the study due to incomplete information and final reviews. The articles were published between 1999 and 2012. Five articles that examined the prevalence or association between human blood type and cutaneous leishmaniasis in Iran were analyzed and evaluated in three sections, including prevalence, related factors, and age groups (Table 1). Three articles examined this relationship in the age group of patients, and two in vitro studies examined the relationship between different human blood groups with cutaneous leishmaniasis.

Table 1: Profile of the studied articles on the frequency of leishmaniasis in different age groups

Row	First author	Type of study	Population	Year	Study tool	Sample size	Age range (year)	Results
1	Vali [28]	Experimental study	Kashan	1999	Blood culture medium	40	Not specified	In human blood groups, parasite growth was higher in RH-negative blood groups than in RH-positive blood groups and higher in blood group B than in other blood groups.
2	Talari [24]	Analytical study	Kashan	2006	Blood culture medium	80	Not specified	The growth rate of the parasite was higher in blood group B^- than others
3	Aflatoonian [23]	Phase I: Descriptive-analytical Phase II: Case-Control	Bam	2007	Questionnaire	600	15-60	People with blood type AB were 1.3 times more likely to develop leishmaniasis than other blood groups (no significant association)
4	Sharafkhah [29]	Descriptive study	Arak	2011	Peripheral blood nephrometry	40	18-25	The percentage of CD_4^+T lymphocytes was the highest in blood groups O and A, respectively, and the lowest frequency of humoral immunity was observed in blood group B, which indicates the lower resistance of blood group B against inflammatory and infectious diseases, such as leishmaniasis.
5	Talari [25]	Case-Control and Descriptive study	Isfahan	2012	Blood culture medium	1514	5-55	The predominant blood groups among patients and the control group were related to blood group A and then blood group O. But generally, the results showed that the blood group was not a risk factor in the occurrence of Zoonotic Cutaneous leishmaniasis and the ABO-Rh blood groups were not associated with the occurrence of ZCL in Iranian patients.

Discussion

Blood groups are one of the factors associated with many infectious and non-infectious diseases, and this relationship has been proven by some researchers [30-33]. According to studies, the most abundant blood group in Iran is group O with 37.94% and Rh^+ with 88.9% [34-36]. This division is consistent with the blood type of tropical countries, such as Bangladesh [37].

Cutaneous leishmaniasis is one of the most common parasitic diseases between humans and animals, considered as one of the six most important infectious diseases in the world [4, 38]. Leishmaniasis organisms are in the form of flagellate promastigotes (extracellular form) found in sandflies and flagellate amastigotes (intracellular form) in vertebrate hosts, including humans. Promastigotes are ingested by tonophils after entering the host body through the bite of a female mosquito. Infected neutrophils may become apoptotic and release live parasites, or these apoptotic cells may be ingested by macrophages with dendritic cells. Promastigotes are ingested by macrophages proliferate and become amastigotes, causing cell rupture and invasion of other macrophages [39]. Some researchers believe that the Leishmania parasite, due to similarities between its ABO blood group antigens and its surface glycoproteins, or by mimicking human blood group antigens, can escape from host defense mechanisms [26, 40].

According to the results of this review, the type of blood in different people is associated with skin leishmaniasis. Aflatoonian et al. aimed at investigating the relationship between cutaneous leishmaniasis and blood groups in Bam showed that the incidence rate among individuals or blood group AB is approximately 1.3 times higher than other blood groups [23].

Talari et al. indicated that the growth of the parasite of this disease in culture medium containing blood group B with Rh-negative is faster than in other blood groups [24]. In another study conducted by Vali and Talari on the effect of human blood groups on the growth of Leishmania major, they concluded that blood group B^- is a more suitable environment for parasite growth [28].The results of these two studies were consistent with the results of Sharafkhah et al. [29]. This study was performed on 40 men aged 18 to 25 years in Arak city by peripheral blood nephelometry method. The results of this review showed that the percentage of CD_4^+T lymphocytes in blood groups O and A are higher than other blood groups, respectively, which may reduce the risk of some infectious and parasitic diseases. It is worth mentioning that the potential impact of blood groups, either directly or indirectly, on humoral immune function, especially natural immunoglobulins, and complement systems, may lead to possible differences in the immune system responses in the blood groups [29].

Rahman Sb and Bari Au evaluated 50 patients with cutaneous leishmaniasis in Pakistan. The results of this review showed that the most common blood group among patients is B positive [41]. Estelle and Dedet, in 2016 studied the association between blood type and leishmaniasis in the United States, and found that there was no association between blood type and disease in 96 patients in French Guiana [42]. Studies conducted in Aleppo, Syria, also showed that there is no relationship between blood type and skin leishmaniasis [22], which could be attributed to the difference in the types of parasite studied in these two studies. Moreover, in a study conducted by Talari and Behzadi in Isfahan to link ABO blood groups and rural cutaneous leishmaniasis, it was concluded that the predominant blood groups among the patients and the control group were related to blood group A and then blood group O. Overall, there was no statistically significant difference between the distribution of ABO blood types and RH in patients [25]. The results of the study conducted in 2009 in Syria by Shanehsas et al. showed that the most predominant blood types among patients and controls were blood group O and then A [22]. In the study by Khanlou and Ardehali to determine the association of blood type with Kala-azar disease (visceral leishmaniasis), it was found that people with blood type O^+ were 12% more affected and people with blood type B^+

were 12% less affected compared to the control group [43].

In general, the results of these studies show the effect of different blood groups on the incidence of cutaneous leishmaniasis, which is in line with the results of the present review.

Conclusion

According to the results of this study, blood group has a significant effect on the incidence of many non-infectious and infectious diseases, such as leishmaniasis. The results of studies have shown that Rh-negative blood groups with B allele were more likely to develop cutaneous leishmaniasis compared to other blood groups. Due to the nativeness of this disease in Iran and considering the complications, treatment costs, and also prevention of psychological damage caused by wound injury, it is required to achieve comprehensive health planning to control the disease.

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Conflict of interest

The authors declare that they have no conflict of interest.

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