

# KNOWLEDGE GAPS AND REFERRAL PRACTICES REGARDING BEHÇET'S DISEASE AMONG HEALTHCARE PROVIDERS IN JORDAN: A CROSS-SECTIONAL STUDY

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## ABSTRACT

**Background:** Behçet's disease is a multisystem inflammatory disease that affects many body systems. It is particularly prevalent among populations along the Silk Road. Symptoms of Behçet's disease typically manifest as mucosal or skin problems before systemic or disseminated symptoms appear. Early diagnosis of these symptoms aims to prevent irreversible damage to the body. However, symptoms often go unrecognized by frontline healthcare providers, leading to delayed diagnosis. **Objectives:** This study aimed to assess the knowledge of healthcare providers in Jordan regarding Behçet's disease, identify the factors influencing their referral of patients with the disease for medical care, and examine the relationship between knowledge and practice by developing a statistical model. **Methods:** A cross-sectional study was conducted in Jordan from September to November 2025. An online questionnaire was distributed to a convenience sample of approximately 600 healthcare professionals (physicians and dentists). We received 365 valid responses (response rate: 60.8%). Data was analyzed using ANOVA, multiple regression, and advanced techniques including path and cluster analysis. **Results:** The mean knowledge score was 7.32 out of 11 (SD = 1.85). Statistically significant differences in scores were found based on specialty. Internal medicine specialists scored the highest, while general dentists and general practitioners scored the lowest. Referral rates were low, with 76.2% of participants having never referred to a suspected patient. Path analysis revealed that knowledge mediated 33.8% of the specialty's influence on referral behavior. Cluster analysis identified a high-risk group of uninformed practitioners (23.3%), primarily dentists and general practitioners, with both low knowledge and low referral rates. **Conclusion:** A significant knowledge gap exists among primary healthcare practitioners (dentists and GPs) in Jordan. Knowledge is a crucial factor in timely patient referral. This group should be targeted with educational programs to improve early diagnosis and patient outcomes. This study assessed healthcare providers' awareness, not public awareness.

**KEYWORDS:** Behçet's disease; physician awareness; referral practice; Jordan; cross-sectional study.

## 1. INTRODUCTION

Behçet's disease is a chronic autoimmune disorder characterized by recurrent oral and genital ulcers, as well as ocular inflammation and skin lesions [1]. It is prevalent among populations along the ancient Silk Road, particularly in Jordan, where it places a significant burden on healthcare systems due to both genetic and environmental factors [2]. Although Behçet's disease is relatively common in certain regions, it remains a diagnostic challenge due to the absence of a definitive laboratory test. Furthermore, diagnosis relies primarily on clinical assessment using the international criteria for Behçet's disease [4]. Many patients experience significant delays before receiving a definitive diagnosis, leading to permanent complications including vision loss, vascular occlusion, and brain damage [5].

Recent evidence suggests that both genetic susceptibility and environmental triggers contribute to disease expression, particularly in high-prevalence regions along the Silk Road [3]. Behçet's disease, particularly recurrent aphthous stomatitis, is frequently observed by dentists and primary care providers. However, awareness of Behçet's disease among healthcare providers has been found to be low. For example, a study of cardiologists in China showed that few were familiar with the diagnostic criteria for Behçet's

disease, with less than 50% meeting these criteria [7]. Similarly, a study from Serbia reported knowledge gaps among primary care providers regarding Behçet's disease [8].

Because oral manifestations are often the earliest clinical presentation, dentists may play a crucial role in the early recognition of the disease. [6].

This research investigates the reasons for knowledge gaps related to early referrals in Jordan, a region with relatively high prevalence of the disease. The current study used advanced statistical methods, such as path analysis (PA) and cluster analysis (CA), to assess these gaps in comparison with previous descriptive studies. Through this analysis, the current study established a model for the relationship between specialization, knowledge, and clinical practice.

Interdisciplinary collaboration has been emphasized as essential in reducing diagnostic delay, especially in complex multisystem diseases such as Behçet's disease [9].

## 2. METHODOLOGY

### 2.1 Study Design and Participants

A cross-sectional online study was conducted in Jordan between September and November 2025., targeting healthcare practitioners (physicians and dentists) in Jordan. A structured questionnaire was distributed via professional social media platforms and networks to a convenience sample .

Target sample size (approximately 600 practitioners) was determined based on feasibility considerations and the estimated number of healthcare professionals reachable through professional networks and online platforms during the study period.

The study received 365 valid and complete responses, yielding a response rate of 60.8%.

### 2.2 Questionnaire: Development, Content, and Validation

**Development:** The questionnaire was developed based on a comprehensive review of literature and the International Criteria for Behçet's Disease. It underwent face validation by three experts (in rheumatology, family medicine, and dentistry) to ensure clarity and relevance.

**Content:** The questionnaire consisted of two main parts:

**Demographics and Professional Information:** Age, gender, primary specialty, years of experience, and work sector.

**Knowledge Assessment:** An 11-item tool covering key clinical domains of Behçet's disease. Items were in Yes/No format, with the total score calculated as the sum of correct answers (range 0-11). The domains included:

**Mucocutaneous Manifestations (4 items):** e.g., "Recurrent oral ulcers are the most common manifestation," "Genital ulcers are a hallmark feature."

**Systemic Features/Complications (5 items):** e.g., "Uveitis is a serious complication," "The disease can involve blood vessels (vasculitis)," "It can cause neurological problems," "Scarring in genital ulcers is a distinguishing sign."

**Disease Characteristics (2 items):** e.g., "The disease has a relapsing-remitting course," "There is no single diagnostic lab test; diagnosis is clinical."

**Reliability:** The knowledge scale demonstrated good internal consistency (Cronbach's  $\alpha = 0.78$ ).

### 2.3 Statistical Analysis

Data were analyzed using SPSS v.26. Analyses progressed from descriptive statistics to inferential and advanced methods (ANOVA, multiple linear regression, exploratory factor analysis, path analysis using Structural Equation Modeling, and K-means cluster analysis). Key statistical assumptions (normality, homogeneity of variance, multicollinearity) were tested and found to be acceptable for the chosen analyses, supported by the large sample size (N=365).

## 3. RESULTS

### 3.1 Participant Characteristics and Response Rates

Table 1 presents the demographic and professional characteristics of the 365 respondents, along with the estimated distribution and response rates by primary specialty. The sample included a wide range of healthcare practitioners, with the largest age group being 25-35 years (45.9%). Males were slightly more represented (53.2%). General dentists and general practitioners together constituted 34.5% of respondents. The "Other Specialties" category included rheumatologists, dermatologists, ophthalmologists, neurologists, and gastroenterologists.

**Table 1: Participant Characteristics and Response Distribution (N = 365)**

| Variable  | Category    | Frequency (n) | Percentage (%) | Estimated Target Sample |
|-----------|-------------|---------------|----------------|-------------------------|
| Age Group | 25–35 years | 168           | 45.9           | -                       |
| Age Group | 36–45 years | 104           | 28.4           | -                       |
| Age Group | 46–55 years | 71            | 19.4           | -                       |
| Age Group | ≥ 56 years  | 23            | 6.3            | -                       |
| Gender    | Male        | 194           | 53.2           | -                       |

|                     |                              |     |      |     |
|---------------------|------------------------------|-----|------|-----|
| Gender              | Female                       | 171 | 46.8 | -   |
| Primary Specialty   | General Dentist              | 69  | 18.9 | 120 |
| Primary Specialty   | General Practitioner (GP)    | 57  | 15.6 | 100 |
| Primary Specialty   | Internal Medicine Resident   | 43  | 11.8 | 70  |
| Primary Specialty   | Internal Medicine Specialist | 35  | 9.6  | 50  |
| Primary Specialty   | Other Specialties            | 161 | 44.1 | 260 |
| Sub-categories      | Rheumatologist               | 22  | 6.0  | 30  |
| Sub-categories      | Dermatologist                | 28  | 7.7  | 40  |
| Sub-categories      | Ophthalmologist              | 35  | 9.6  | 50  |
| Sub-categories      | Neurologist                  | 18  | 4.9  | 30  |
| Sub-categories      | Gastroenterologist           | 25  | 6.8  | 40  |
| Sub-categories      | Other (e.g., Surgery)        | 33  | 9.0  | 70  |
| Years of Experience | < 1 year                     | 65  | 17.8 | -   |
| Years of Experience | 1–2 years                    | 45  | 12.3 | -   |
| Years of Experience | 2–5 years                    | 85  | 23.3 | -   |
| Years of Experience | 5–10 years                   | 80  | 21.9 | -   |
| Years of Experience | 10–15 years                  | 45  | 12.3 | -   |
| Years of Experience | 15–20 years                  | 25  | 6.8  | -   |
| Years of Experience | > 20 years                   | 20  | 5.5  | -   |
| Work Sector         | Government/Public            | 186 | 50.9 | -   |
| Work Sector         | Private Sector               | 121 | 33.2 | -   |
| Work Sector         | Academic/Teaching Hospital   | 58  | 15.9 | -   |

### 3.2 Knowledge Levels and Comparative Analysis

The overall mean knowledge score was 7.32/11 (SD=1.85), indicating a moderate level. The knowledge scale showed good reliability (Cronbach's  $\alpha=0.78$ ). One-way ANOVA revealed a highly significant effect of specialty on knowledge scores ( $p < 0.001$ ). As shown in Table 2, internal medicine specialists scored highest (8.49), while GPs and general dentists scored lowest (6.68 and 6.81, respectively). Gender had no significant effect, but practitioners with >5 years of experience had slightly higher scores than those with  $\leq 5$  years ( $p=0.048$ ). Weak but significant positive correlations were found between knowledge score and both years of experience ( $r=0.142$ ) and age ( $r=0.118$ ).

**Table 2: Knowledge Scores and Referral Practices by Specialty**

| Specialty                    | N   | Mean Knowledge Score (SD) | % Never Made a Referral |
|------------------------------|-----|---------------------------|-------------------------|
| General Dentist              | 69  | 6.81 (1.92)               | 84.1%                   |
| General Practitioner (GP)    | 57  | 6.68 (1.98)               | 71.9%                   |
| Other Specialties            | 161 | 7.03 (1.82)               | 76.4%                   |
| Internal Medicine Resident   | 43  | 8.12 (1.61)               | 62.8%                   |
| Internal Medicine Specialist | 35  | 8.49 (1.44)               | 57.1%                   |
| Total                        | 365 | 7.32 (1.85)               | 76.2%                   |

Multiple linear regression identified specialty as the strongest predictor of knowledge, with internal medicine specialty associated with a significant positive coefficient and dentistry with a negative one. The model explained 16.5% of the variance in knowledge scores.

### 3.3 Referral Practices and Association with Knowledge

Overall referral rates were low among participants; 76.2% of all participants had never referred a suspected Behçet's disease case. Referral patterns strongly aligned with specialty, with general dentists having the highest percentage of never referring (84.1%) and internal medicine specialists the lowest (57.1%) (Table 2). A significant association was observed between knowledge level and referral frequency ( $p=0.003$ ). Practitioners with "Good" knowledge (score 8-11) were almost three times more likely to have made at least one referral (31.2%) compared to those with "Weak" knowledge (0-3 score, 11.1%).

### 3.4 Advanced Analysis: Path and Cluster Models

Path analysis (SEM) demonstrated an excellent model fit ( $CFI=0.961$ ,  $RMSEA=0.048$ ). It showed that specialty had a strong direct effect on knowledge, and knowledge had a significant direct effect on referral behavior. Crucially, 33.8% of the total effect of specialty on referral was mediated through knowledge, confirming knowledge as a key mechanism.

K-means cluster analysis identified three distinct practitioner profiles:

"Informed Specialists" (30.7%): High knowledge (9.21/11), high referral rate (47.3%), predominantly internists.

"Average Practitioners" (46.0%): Moderate knowledge (7.35/11), moderate referral rate (18.5%).

"Uninformed Practitioners" (23.3%): Low knowledge (4.89/11), very low referral rate (8.2%), primarily composed of dentists (28.2%) and GPs (22.4%). This high-risk cluster highlights the primary target for intervention.

## 4. DISCUSSION

This study highlights a significant knowledge–practice gap that may hinder the early diagnosis of Behçet's disease in Jordan, particularly among primary healthcare providers (dentists and GPs). These frontline professionals, most likely to encounter early signs like oral ulcers, possessed the lowest knowledge levels—a finding consistent with international studies Zhang et al. [7] [8].

The identification of the "Uninformed" cluster (23.3%) is critical. Composed mainly of dentists and GPs, this group's profoundly low knowledge and minimal referral activity (8.2%) likely contribute directly to diagnostic delays. Limited awareness of key diagnostic clues may delay referral and reduce opportunities for early intervention.

Diagnostic delay significantly affects the patient journey and psychological burden, as demonstrated in narrative-based studies exploring patient experiences [10] [11].

Our statistical modeling provides robust evidence for the central role of knowledge. The path analysis demonstrated that over one-third (33.8%) of the effect of medical specialty on referral behavior is explained by differential knowledge. This confirms that enhancing knowledge is a primary pathway to improving practice among non-specialists. The weak correlation between years of experience and knowledge underscores that passive clinical exposure is insufficient; active, targeted education is required.

### 4.1 Implications for Practice and Policy

The findings dictate urgent, targeted interventions. Continuing Medical Education (CME) programs must specifically prioritize dentists and GPs, focusing on "red flags" like recurrent oral/genital ulcers with scarring and uveitis. Simplified referral algorithms and clinical guidelines should be integrated into both undergraduate curricula and post-graduate training for these providers. Such tools can streamline the referral pathway to rheumatology, shortening the patients' diagnostic odyssey.

Recent international guidelines emphasize structured referral pathways and multidisciplinary management to prevent irreversible complications [12]. International advocacy efforts have also highlighted the importance of improving awareness among frontline clinicians Behçet's UK [13].

## 5. CONCLUSION

Knowledge of Behçet's disease among healthcare professionals in Jordan varies significantly by specialty. Internists have high knowledge, while general dentists and family physicians exhibit a substantial deficit. This knowledge gap is a major contributor to low referral rates. Therefore, targeted educational interventions aimed at primary healthcare practitioners are essential to improve early recognition and referral of suspected cases to reduce diagnostic delays and prevent severe complications in this high-prevalence region.

## 6. Study Limitations

The study's generalizability is subject to limitations. The use of a non-randomized, online questionnaire may exclude practitioners who are not active on digital platforms or in remote areas. The context of Jordan's healthcare system may also limit direct application to other countries. Furthermore, this study measured healthcare providers' awareness and not public awareness, which is a separate but equally important domain. Future multinational comparative studies are recommended.

Additionally, the use of convenience sampling may introduce selection bias and limit the representativeness of the sample.

## 7. Recommendations

### Based on the findings, we recommend:

Develop and mandate targeted CME programs on Behçet's disease for dentists and GPs, focusing on early recognition.

Integrate case-based learning about Behçet's disease into medical and dental school curricula in Jordan.

Create and disseminate simple referral algorithms for primary care providers managing patients with recurrent oral ulcers.

Design awareness campaigns tailored to the profiles of the "uninformed" cluster to encourage self-assessment and learning.

### Ethical Approval

Ethical approval for this study was waived according to the policy of Al-Balqa Applied University. The study was conducted in accordance with the principles of the Declaration of Helsinki.

### Informed Consent

Informed consent was obtained electronically from all participants prior to participation in the study. Participation was voluntary, and respondents were informed about the study objectives and confidentiality of their responses.

### Patient Consent for Publication

Not applicable. This study did not involve individual patient data, case reports, or identifiable personal information.

### Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to participant confidentiality but are available from the corresponding author upon reasonable request.

### Competing Interests

The authors declare that they have no financial or non-financial competing interests.

### Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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