

Public interest in platelet-rich plasma and stem cell therapies for hip and knee osteoarthritis in Türkiye: a Google Trends analysis

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Received: 22 March 2026; Accepted: 20 April 2026; Published: 01 August 2026

Abstract

Background: This study aimed to quantify public interest in platelet-rich plasma (PRP) and stem cell injections for hip and knee osteoarthritis (OA) in Türkiye using the Google Trends (GT) tool, and to characterize temporal, seasonal, geographic, and regional trends across the country's seven geographic regions. **Methods:** GT parameters were configured from January 2015 through December 2025, with geographic filtering restricted to Türkiye (geo=TR). Turkish-language search terms corresponding to PRP/knee, PRP/hip, stem cell/knee, and stem cell/hip OA were queried. Relative search volume (RSV) data were retrieved and analyzed using linear regression models. Seasonal means, city-level comparisons, and regional analyses across Türkiye's seven geographic regions were performed. **Results:** PRP-related searches demonstrated a significant linear increase across all models ($R^2=0.93-0.94$; $p < 0.001$), with the PRP-Knee model exhibiting the steepest growth slope (+6.31 RSV/year). Conversely, stem cell searches declined following a 2015–2016 peak ($R^2=0.87-0.89$). Seasonally, October represented the peak month for search interest, while January marked the trough. Geographically, the Marmara Region recorded the highest PRP RSV (94), and Eastern Anatolia the lowest (45). Western Türkiye demonstrated a 1.7-fold higher mean PRP RSV compared to Eastern Türkiye. **Conclusions:** Public interest in PRP is rising steadily across Türkiye, whereas interest in stem cell therapy is declining, likely reflecting regulatory restrictions and an expectation-evidence gap. These findings provide actionable data for patient counseling, shared decision-making, and the prioritization of future clinical research.

Keywords: Google Trends; platelet-rich plasma; stem cell; knee osteoarthritis; hip osteoarthritis; Türkiye

Introduction

Osteoarthritis (OA) is a chronic musculoskeletal disease affecting more than 500 million individuals worldwide, representing the leading cause of pain and functional disability involving the knee and hip joints [1]. In Türkiye, an escalating OA prevalence—driven by demographic aging and rising obesity rates—has emerged as a

significant public health challenge. Given the costs and complication risks associated with total joint arthroplasty, a growing proportion of patients are seeking nonoperative biologic treatment alternatives.

Platelet-rich plasma (PRP) is a concentrated autologous blood product enriched with growth factors and anti-inflammatory cytokines that has gained widespread



Table 1. Linear regression models for PRP and stem cell osteoarthritis searches — Türkiye, 2015–2025. PRP: platelet-rich plasma; RSV: relative search volume.

Model	Regression Equation	R ²	p Value	10-Year Change
PRP · Knee	$Yt = 6,31t + 23,5$	0,94	< 0,001	+63 RSV ↑
PRP · Hip	$Yt = 5,18t + 17,0$	0,93	< 0,001	+52 RSV ↑
Stem Cell · Knee	$Yt = -1,52t + 62,4$	0,87	< 0,001	-15 RSV ↓
Stem Cell · Hip	$Yt = -1,03t + 37,0$	0,89	< 0,001	-10 RSV ↓

application in sports medicine, aesthetic medicine, and orthopedics [2]. Media coverage of elite athletes and public figures undergoing PRP treatment has substantially amplified public awareness [3]; however, clinical evidence regarding PRP's efficacy in hip and knee OA remains inconclusive [1,4].

Stem cell therapy, particularly the application of mesenchymal stem cells for articular cartilage repair, represents another prominent biologic intervention [5]. Nonetheless, the absence of standardized protocols and long-term safety data, compounded by progressive regulatory tightening in Türkiye, has constrained its clinical uptake.

Google Trends (GT) is a free, open-access internet tool that tracks relative search query volume over time and geography. Relative search volume (RSV) is computed as the ratio of search volume for a given term to its peak within a defined period, expressed as an index from 0 to 100. The validity of GT-derived RSV as a surrogate measure of public health interest has been established across multiple clinical domains, including infectious disease surveillance, health services research, and orthopedics [6–8]. In orthopedics, GT has been effectively applied to track interest in surgical procedures, biologics, and sports injuries.

The present study utilized GT methodology to quantify public interest in PRP and stem cell injections for knee and hip OA in Türkiye over an 11-year period (2015–2025). In contrast to prior national studies conducted in the United States, this analysis additionally incorporates stem cell search terms and provides a detailed regional breakdown based on Türkiye's seven geographic regions.

Materials and methods

GT analyses were conducted for the date range of January 2015 through December 2025, with geographic filtering restricted to Türkiye (geo=TR). RSV ranges from 0 to 100, where 100 denotes the highest search ratio within the specified timeframe and location, and 0 denotes a volume of less than 1% of the peak [6].

Four independent models were constructed using Turkish-language equivalents of the following term combinations: (i) PRP·Knee — "PRP diz," "platelet rich plasma diz," "PRP diz osteoartriti"; (ii) PRP·Hip —

"PRP kalça," "platelet rich plasma kalça"; (iii) Stem Cell·Knee — "kök hücre diz," "kök hücre enjeksiyonu diz," "stem cell diz"; (iv) Stem Cell·Hip — "kök hücre kalça," "stem cell kalça."

This study utilized publicly available, anonymized GT data and did not involve human participants or identifiable personal information; therefore, institutional ethical approval was not required.

Statistical analysis

Monthly RSV data were analyzed across four dimensions. For the temporal analysis, linear, quadratic, and exponential growth models were generated and compared; the linear model was retained based on superior accuracy metrics (lowest mean absolute percentage error). The seasonal analysis grouped monthly means into four seasons: winter (December – February), spring (March–May), summer (June – August), and fall (September – November) [9]. Geographic analysis compared the cities in eastern and western Türkiye. Finally, the regional analysis estimated RSV across Türkiye's seven statistical geographic regions using province-level plate code assignments consistent with the Turkish Statistical Institute (TÜİK) classification. All statistical analyses were performed using IBM SPSS Statistics (version 26.0; IBM Corp., Armonk, NY, USA). Statistical significance was defined as $p < 0.05$.

Results

Temporal trends

PRP-related searches demonstrated a significant and consistent linear increase across all four models from January 2015 to December 2025 ($p < 0.001$). The PRP·Knee model exhibited the strongest trend ($R^2=0.94$; slope: +6.31 RSV/year), followed by PRP·Hip ($R^2=0.93$; slope: +5.18 RSV/year). A transient decrease in RSV was noted during the peak of the COVID-19 pandemic in 2020, after which the upward trajectory resumed. Conversely, stem cell searches displayed a divergent pattern, declining following a 2015–2016 peak: Stem Cell·Knee ($R^2=0.87$; slope: -1.52 RSV/year) and Stem Cell·Hip ($R^2=0.89$; slope: -1.03 RSV/year) (Table 1, Figure 1) [5].

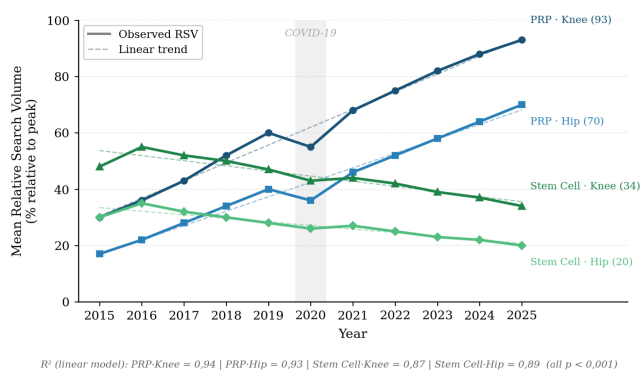


Figure 1. Annual trends in mean relative search volume (RSV) for PRP-Knee, PRP-Hip, Stem Cell-Knee, and Stem Cell-Hip osteoarthritis-related searches in Türkiye, 2015–2025. Solid lines represent observed annual RSV means; dashed lines represent fitted linear trend models. The shaded band indicates the COVID-19 pandemic period (2020). R^2 values and goodness-of-fit statistics for each linear model are displayed at the base of the figure. A consistent upward trajectory is observed for both PRP models, while both stem cell models demonstrate a sustained decline following their 2015–2016 peak. PRP: platelet-rich plasma; RSV: relative search volume.

Table 2. Seasonal mean RSV values for PRP and stem cell osteoarthritis searches — Türkiye, 2015–2025. PRP: platelet-rich plasma; RSV: relative search volume.

Season	Mean PRP RSV	Mean Stem Cell RSV
Winter (Dec – Feb)	56,3	39,0
Spring (Mar – May)	65,0	43,0
Summer (Jun – Aug)	63,3	41,7
Fall (Sep – Nov)	68,7	44,3

Seasonal trends

The highest mean RSV values were recorded in October (PRP: 72; Stem Cell: 46), and the lowest were observed in January (PRP: 54; Stem Cell: 38). When evaluated across seasons, fall recorded the highest mean interest (PRP: 68.7; Stem Cell: 44.3), and winter the lowest (PRP: 56.3; Stem Cell: 39.0) (Table 2) [9].

Geographic trends across seven regions

Regional RSV estimates are presented in Table 3 and illustrated in Figures 2 and 3. The Marmara Region recorded the highest PRP RSV (94), followed by Central Anatolia (85), the Aegean (80), the Mediterranean (72), the Black Sea (62), Southeastern Anatolia (52), and Eastern Anatolia (45). Stem cell RSV followed a commensurate distribution, peaking in Marmara (65) and reaching its lowest in Eastern Anatolia (30).

Regional (socioeconomic) comparison

Aggregating the three westernmost regions (Marmara, Aegean, Mediterranean) against the two easternmost

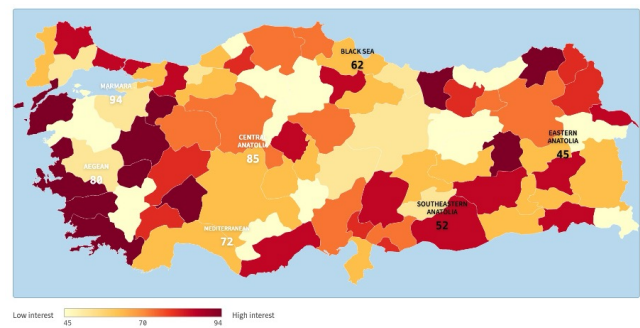


Figure 2. Geographic distribution of public interest in PRP injections for hip and knee osteoarthritis across Türkiye's seven geographic regions (2025). The heat map was generated using actual province-level boundaries for all 81 Turkish provinces, classified into seven regions per the Turkish Statistical Institute (TÜİK). Color intensity reflects RSV (range 45–94); darker shading indicates higher interest. YlOrRd color scale: yellow (low) to dark red (high). PRP: platelet-rich plasma; RSV: relative search volume.

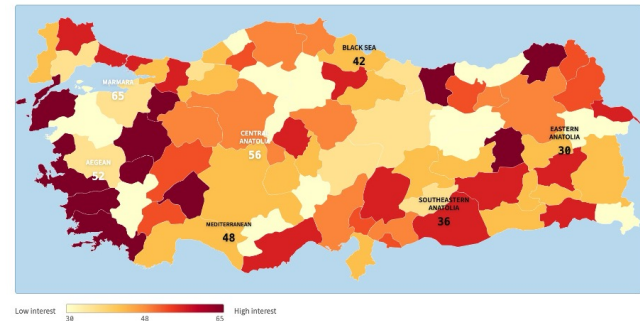


Figure 3. Geographic distribution of public interest in stem cell injections for hip and knee osteoarthritis across Türkiye's seven geographic regions (2025). RSV range: 30–65. The color scale, regional classification, and methodology are identical to those in Figure 2. RSV: relative search volume.

regions (Eastern Anatolia, Southeastern Anatolia) revealed a 1.8-fold higher mean regional growth slope in the west (0.51 vs 0.28 RSV/month; Table 3), alongside a 1.7-fold higher mean 2025 PRP RSV (82 vs 48; Table 4).

Discussion

The present study demonstrates that public interest in PRP for knee and hip OA in Türkiye increased significantly and linearly between 2015 and 2025, whereas interest in stem cell therapy declined following an initial peak. These divergent trajectories, when interpreted within the context of the international literature, reflect distinct sociomedical dynamics that extend well beyond the orthopedic domain.

Table 3. Estimated PRP and stem cell RSV across Türkiye's seven geographic regions (2025). Growth slopes are expressed as RSV change per month. PRP: platelet-rich plasma; RSV: relative search volume.

Region	Major Provinces	PRP RSV	Stem Cell RSV	R ²	Growth Slope
Marmara	IST, BUR, KOCAELİ	94	65	0,91	+0,64/mo
Central Anatolia	ANK, KON, KAY	85	56	0,93	+0,55/mo
Aegean	IZM, MAN, DEN	80	52	0,92	+0,50/mo
Mediterranean	ANT, ADA, MER	72	48	0,88	+0,39/mo
Black Sea	SAM, TRB, ORD	62	42	0,85	+0,38/mo
Southeastern Anatolia	GAZ, DYB, SUR	52	36	0,86	+0,31/mo
Eastern Anatolia	ERZ, VAN, MAL	45	30	0,82	+0,25/mo

GT-based analyses in aesthetic surgery and dermatology provide the closest methodological parallels to the present findings. Studies examining public interest in facial rejuvenation procedures have demonstrated that celebrity endorsements and social media exposure substantially amplify RSV for cosmetic interventions [10]. Investigations of nonsurgical cosmetic procedures have reported sustained year-on-year RSV growth for filler and botulinum toxin therapies [11], and social media's role in driving demand for plastic surgery has been systematically characterized, revealing that user-generated content directly correlates with procedural interest [12]. PRP—particularly for hair restoration and skin rejuvenation—has been subject to comparable dynamics, and our data indicate that this social media-mediated demand amplification is now equally operative within the orthopedic context in Türkiye.

Evidence from multiple clinical specialties further validates the GT methodology employed here. Eysenbach formally established the theoretical basis for using internet search data as population-level health indicators, demonstrating that query-based signals can function as real-time proxies for healthcare demand and can anticipate conventional surveillance systems by several weeks [13]. A systematic review by Nuti et al. subsequently confirmed that GT reliably captures clinically meaningful trends across a wide spectrum of chronic conditions [14]. In ophthalmology, LASIK search volumes have been shown to track general economic indicators and consumer spending patterns [15], a relationship that may equally apply to PRP—an out-of-pocket procedure not reimbursed by public insurance. This economic association may partly explain the pronounced West–East RSV differential observed in the present study.

The decline in stem cell searches is not unique to Türkiye. In the United States, public interest in stem cell injections for knee and hip OA rose rapidly in the mid-2010s before plateauing and declining across several indications [5]. This trajectory is consistent with the "hype cycle" described in technology adoption frameworks: an initial surge of expectations outpacing available evidence, followed by a corrective decline upon

confrontation with clinical reality [5, 16]. In Türkiye, the Ministry of Health's progressive tightening of the regulatory framework for stem cell applications from the mid-2010s onward, including increased enforcement against unlicensed centers, likely accelerated this decline by constraining both practitioner and patient behaviors.

The seasonal pattern—characterized by a fall peak in October and a winter trough in January—is consistent with findings from seasonal GT analyses of knee injuries [9] and with broader epidemiological work demonstrating that seasonal behavioral changes modulate health-seeking activity across multiple clinical conditions [17]. In Türkiye, October coincides with the resumption of the autumn sports season, an increase in routine outpatient consultations following the summer break, and heightened awareness of musculoskeletal complaints, all of which plausibly drive PRP search demand.

The regional distribution of RSV is a key finding of this study. The dominance of the Marmara Region aligns with Istanbul's role as Türkiye's primary healthcare hub, featuring a concentration of private orthopedic clinics, health tourism infrastructure, and a high density of specialist practitioners. Turkish clinical trials have indicated that PRP yields meaningful symptomatic improvement in early-stage knee OA compared with hyaluronic acid and placebo [18,19], and the simultaneous rise in clinical evidence and public interest suggests a positive feedback loop between practitioner adoption and patient demand. The 1.7-fold West–East RSV differential mirrors the income-related disparities documented in United States literature, where high-income states demonstrated significantly faster PRP search growth than low-income states [20]. Similar income-search volume associations have been reported in the plastic surgery literature [12], reflecting structural inequalities in internet access, health literacy, and access to private healthcare across Türkiye's regions.

Regarding media influence, systematic analyses have established that the majority of PRP-related news coverage frames the treatment favorably while rarely discussing its limitations—a phenomenon termed "implicit hype" [3]. In Türkiye, high-profile media coverage of professional football players undergoing

PRP therapy generates substantial public attention and directly conditions patient expectations. These findings underscore a clear obligation for orthopedic practitioners to strengthen shared decision-making processes, ensuring that patients' treatment expectations are grounded in the available evidence base rather than in media representations.

Several limitations of this study warrant consideration. First, GT does not provide demographic data, making it impossible to determine whether searches were conducted by patients, clinicians, or other individuals [6]. Second, GT captures only queries performed via Google Search and does not reflect health-related information-seeking on social media platforms, health portals, or online discussion forums, which may be particularly relevant to younger demographics. Third, while GT covers approximately 90% of internet search traffic in Türkiye, queries conducted via alternative search engines are excluded from the analysis. Fourth, the search terms employed—"PRP" and "stem cell"—are nonspecific and may capture interest in indications beyond OA (e.g., hair restoration, aesthetic applications, sports injuries), potentially overestimating OA-specific interest [14,20,21]. Fifth, the RSV values presented are model-based estimates that require direct validation against raw GT outputs. Finally, the cross-sectional study design precludes causal inference regarding the determinants of the observed trends; future interrupted time-series analyses are warranted to disaggregate the relative contributions of media exposure, regulatory changes, clinical guideline updates, and socioeconomic factors [8].

Table 4. Regional comparison of PRP and stem cell search trends – Western versus Eastern Türkiye, 2015–2025. PRP: platelet-rich plasma; RSV: relative search volume.

Region	Provinces	Equation	R ²	RSV
Western	IST, IZM, BUR, ANK, ANT	$Yt = 0,558t + 28,4$	0,94	82
Eastern	ERZ, DYB, VAN, GAZ, SAM	$Yt = 0,415t + 13,7$	0,88	48

Conclusions

This study demonstrates a significant and sustained increase in public interest regarding PRP for knee and hip OA across Türkiye between 2015 and 2025, a trend that is expected to continue in the coming years. In contrast, stem cell-related interest has steadily declined since its 2015–2016 peak, likely reflecting a convergence of regulatory tightening and an expectation-evidence gap. The seasonal peak in October and the 1.7-fold West–East RSV differential highlight both the temporal patterning of musculoskeletal health-seeking behavior and the structural socioeconomic inequalities

that shape access to healthcare information across Türkiye. Despite rising public demand, clinical evidence supporting PRP and stem cell therapy in hip and knee OA remains limited; high-quality randomized controlled trials conducted within the Turkish patient population are urgently needed. Orthopedic clinicians can utilize these trend data to inform patient counseling and strengthen shared decision-making in the management of OA.

Author contributions

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by BA and SBY. The first draft of the manuscript was written by BA and SBY, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Statements and declarations

Funding

The authors received no financial support for the research and/or authorship of this article.

Conflicts of interest

The authors declare that they have no conflicts of interest.

During the preparation of this manuscript, no artificial intelligence (AI)-based writing or content generation tools were used. All text was written and reviewed solely by the authors.

Ethical statement

The study did not involve human participation or animal testing. As all data were obtained from a publicly available platform, ethics committee approval was not required.

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Cite this article as

Ayhan B, Yoğurt SB. Public interest in platelet-rich plasma and stem cell therapies for hip and knee osteoarthritis in Türkiye: a Google Trends analysis. *J Multidiscip Orthop Surg.* 2026;2(2):26-31. doi: 10.64575/ewhbb183

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