



Türk Diyabet

Hemşireliği

Turkish Journal of Diabetes Nursing

Dergisi

CİLT 6 • SAYI 1

Ocak - Haziran 2026

■ Turkish Validity and Reliability Study of Patient Interpretation of Neuropathy Questionnaire

Ozlem Eker AKPINAR
Selda ÇELİK

■ Validity and Reliability of the Turkish Version of the Diabetes Intention, Attitude and Behavior Questionnaire

Sibel YOLCU
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■ Complementary and Alternative Medicine Use, Self-Care, and Factors Affecting These in Patients with Diabetes

Melike DEMİR DOĞAN
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■ Beden Eğitimi ve Spor Öğretmenliği Öğrencilerine Verilen Tip 1 Diyabet ile İlgili Akran Eğitiminin Etkinliği

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■ A Bibliometric Analysis of Research on Diabetes in Nursing: A Retrospective Descriptive Study

Sibel YOLCU



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Editör:

Prof. Dr. Nermin OLGUN

Önsöz

Değerli Okuyucularımız,

Diyabet Hemşireliği Derneği'nin bilimsel yayın organı olan Turkish Journal of Diabetes Nursing (TJDN), yılda iki kez Türkçe ve İngilizce dillerinde, elektronik ortamda ve açık erişimli olarak yayımlanmaktadır. Dergimiz; 2021 yılından itibaren DRJI (The Directory of Research Journal Indexing), Research Bible, Scilit, ASOS Index, ROAD, TÜRK MEDLINE, Türkiye Atıf Dizini ve 2022 yılından itibaren Index Copernicus veri tabanlarında dizinlenmektedir. Makale başvuruları, <https://tjdn.org/> adresinde yer alan çevrim içi sistem üzerinden kabul edilmektedir.

Bu yıl gerçekleştirilen **28. Ulusal Diyabet Hemşireliği Sempozyumu**'nda da diyabet bakımının güncel ve geleceğe dönük başlıkları çok yönlü olarak ele alınmıştır. "Diyabet Eğitiminde Dijital Dönüşüm" panelinde yapay zekâ destekli hasta eğitimi, oyunlaştırılmış eğitim modelleri, dijital öz yönetim programları ve mobil sağlık uygulamaları tartışılmış; diyabet eğitiminde teknolojinin sunduğu olanaklar ve hemşirelik uygulamalarına yansımaları değerlendirilmiştir. "İş Yerinde Diyabet: Riskler ve Koruyucu Yaklaşımlar" panelinde ise diyabetli bireylerin çalışma yaşamında karşılaştıkları sorunlar, diyabet dostu iş yeri yaklaşımı ve koruyucu uygulamalar gündeme alınmıştır.

Sempozyum programında ayrıca diyabet teknolojilerinde bireyselleştirilmiş klinik uygulamalar, CGM raporlarının ve insülin pompası verilerinin yorumlanması, diyabetik ayakta güncel yaklaşımlar, obezite tedavisinde GLP-1 analogları ve yeni ilaçlar ile geriatrik vakalarda diyabet yönetimi gibi alanın önemli başlıkları ele alınmıştır. Bu içerikler, diyabet hemşireliğinin klinik bakım, eğitim, teknoloji kullanımı, etik sorumluluk, komplikasyon yönetimi ve yaşam boyu bakım süreçlerinde ne kadar geniş ve etkili bir rol üstlendiğini bir kez daha göstermiştir.

TJDN'nin bu sayısında yer alan araştırma makaleleri de diyabet hemşireliğinin bu çok boyutlu yapısını yansıtmaktadır. Sayımızda iki ölçek geçerlik ve güvenirlik çalışması, diyabetli bireylerde tamamlayıcı ve alternatif tıp kullanımı ile öz bakımı ele alan bir saha araştırması, Tip 1 diyabet konusunda akran eğitiminin etkinliğini değerlendiren bir eğitim çalışması ve diyabet alanındaki bilimsel üretimi görünür kılan iki bibliyometrik araştırma yer almaktadır.

Bu sayının, diyabet hemşireliği alanında çalışan araştırmacılara, klinisyen hemşirelere, eğitimcilere ve politika yapıcılara katkı sağlamasını diliyoruz. Dergimize bilimsel çalışmalarıyla katkı sunan tüm yazarlarımıza, değerlendirme süreçlerinde emek veren hakemlerimize, yayın kurulu ve danışma kurulu üyelerimize teşekkür ederiz.

Gelecek sayılarımızda da diyabet hemşireliği alanının gelişimine hizmet eden özgün araştırmalar, güncel derlemeler ve klinik uygulama örnekleriyle sizlerle yeniden buluşmayı dileriz.

Saygılarımızla,

Prof. Dr. Nermin OLGUN

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Dergimiz basın meslek ilkelerine uymaktadır.

Cilt 6 - Sayı 1

Ocak-Haziran 2026

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Yazarlara Bilgi

Amaç ve Kapsam

Türk Diyabet Hemşireliği Dergisi (Turkish Journal of Diabetes Nursing, TJDN), Diyabet Hemşireliği Derneği'nin bilimsel resmi yayın organıdır. TJDN diyabet başta olmak üzere obezite, hipertansiyon, metabolik hastalıklar ile ilgili bilimsel makalelerin yayınlanması için elektronik ortamda açık erişimli ve hakemli bir akademik dergidir. TJDN yılda iki kez yayınlanır ve yayınlanan yazılardan, yazarlardan veya okuyuculardan herhangi bir ücret talep etmez. Yayın dili Türkçe ve İngilizce'dir.

Yazım Kuralları

- Yazılar **İngilizce ya da Türkçe** yazılmalıdır. Türkçe yazılan çalışmalar için kelimelerin yazımında "Türk Dil Kurumu Sözlükleri (<https://www.sozluk.gov.tr>)" İngilizce yazılan çalışmalar için kelimelerin yazımında "Oxford English Dictionary (<https://www.oed.com>)" referans alınmalıdır. İngilizce yazılan çalışmalara yayın önceliği sağlanacaktır.
- İngilizce özetlerde **objectives, methods, results, conclusion** bölümlerine yer verilmelidir.
- Anahtar sözcükler en az 3 ve en fazla 5 sözcük** olarak belirtilmelidir. Türkçe anahtar kelimeler "Türkiye Bilim Terimleri"ne uygun olmalıdır. İngilizce anahtar kelimeler **Index Medicus Medical Subject Headings (MeSH)** standartlarına uygun olmalıdır.
- Metin içerisinde geçen birimlerin sembolleri **Uluslararası Birimler Sistemi (SI)**'ne göre verilmelidir.
- (), " " ve / işareti kullanılan yerlerde cümle/kelime öncesi ve sonrası boşluk bırakılmadan yazılmalıdır.
- Metin içinde maddelendirmelerde sayı ya da harf kullanılmamalıdır.
- Çeşitli istatistikler; örneğin, varyans analizi değerleri (F, t, z), korelasyon (R, r) ve diğer istatistiksel göstergeler rapor edilirken italik gösterilmelidir.
- İlaçların jenerik adları kullanılmalıdır. Ticari isim kullanılmamalıdır.
- Başlıkta veya özet bölümünde kısaltma kullanılmamalıdır.** Kısaltmalar, ilgili kelimelerin metin içinde ilk kullanıldığı yerde yapılmalıdır.
- Özet bölümünde kaynak belirtilmemelidir.
- Tablo başlıkları tablonun üzerinde verilmeli ve kelimelerin ilk harfi büyük olmalıdır** (Örn: Tablo 1: Diyabetli Bireylerin Özellikleri).
- Şekil/grafik başlıkları şekil/grafiklerin altında verilmeli, italik yazılmalı ve kelimelerin ilk harfi küçük olmalıdır** (Örn: Şekil 1: Miller'in klinik değerlendirme için ustalık piramidi).

- Tüm makaleler yazı çeşitleri bölümünde belirtilen şekilde hazırlanmalı ve aşağıdaki tabloda gösterilen kelime sınırını aşmamalıdır.
- Bu sınırlamada **özet, kaynaklar, tablo, sekil, grafik ve teşekkür bölümleri yer almaz.**

Makale Tipi

- Orjinal Araştırma
- Derleme
- Editöre Mektup
- Olgu sunumu

Kelime Sınırı

- 5000
- 5000
- 500
- 3000

Yayının Hazırlanması

Türk Diyabet Hemşireliği Dergisi'nin yazım kuralları **Amerikan Psikoloji Derneği (APA)** yazım kuralları temel alınarak belirlenmiştir. (<http://www.apastyle.org>)

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- Kapak (Başlık) Sayfası
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- Anahtar Kelimeler
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- Tartışma*
- Sonuç
- Etik Kurul Onayı
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- Kaynaklar

* Yazı türüne göre yer verilir.

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- Türkçe ve İngilizce makalenin ana başlığı ve kısa başlıklar yazılmalı (**kelimelerin ilk harfleri büyük olmalı, makalenin kısa başlığı 6 kelimeyi geçmemelidir**)
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Prospektif, retrospektif ve her türlü deneysel ve tanımlayıcı çalışmalardır. Araştırma makalesi **özet, giriş, amaç, yöntem, bulgular, tartışma ve sonuç** bölümlerinden oluşur.

Özet

Ortalama 200-250 kelime olmalı; amaç, yöntem, bulgular ve sonuç bölümlerinden oluşmalı ve Türkçe ve İngilizce olarak hazırlanmalıdır.

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1. En az 3, en fazla 5 kelimedenden oluşacak şekilde, Türkçe ve İngilizce yazılmalıdır.
2. Kelimeler birbirlerinden noktalı virgül (;) ile ayrılmalıdır.
3. İngilizce anahtar kelimeler "Medical Subject Headings (MESH)"e uygun olarak verilmelidir. Anahtar kelime seçimi için, izleyen bağlantı tıklanarak açılan sayfada, ilgili konuya ait uygun kelime girilerek anahtar kelimelere ulaşılabilir (<http://www.nlm.nih.gov/mesh/MBrowser.html>).
4. Türkçe anahtar kelimeler "TR Dizin Anahtar Terimler Listesi" ve "Türkiye Bilim Terimleri (TBT)"ne uygun olarak verilmelidir (<http://www.bilimterimleri.com>).

Giriş

Bu bölümde makalenin amacı ve dayandığı bilimsel düşünceler açık olarak ifade edilmeli; ortaya konan sorun hemşirelikle ilişkilendirilmeli; ortaya konan sorunla ilgili bilgi açığı belirtilmelidir.

Amaç

Araştırmanın amacı ve hipotezi ya da araştırma soruları yazılmalıdır.

Yöntem

Bu bölümde, araştırmanın türü, yapıldığı yer, örnekleme, veri

toplama araçları, ön uygulama (varsa) ve uygulamanın nasıl ve ne zaman yapıldığı, etik yönü ve verilerin toplanması, verilerin değerlendirilmesi, araştırmanın sınırlılıkları yer almalıdır.

Bulgular

Bulgular, araştırma sorularına yanıt verecek şekilde ve sistematik biçimde sunulmalıdır.

Tartışma

Tartışma, araştırma sorularına yanıt verecek şekilde ve sistematik biçimde sunulmalıdır. (Niteliksel çalışmalarda bulgular ve tartışma bölümü birlikte verilir).

Sonuç ve Öneriler

Bu bölümde konunun önemi vurgulanmalı; araştırma sonuçlarının hemşirelik uygulamalarına katkısı ile birlikte öneriler verilmelidir.

Derleme Makaleler

Uluslararası ve ulusal kaynaklardan yararlanarak, konu ile ilgili temel tartışmaların ortaya koyulduğu ve yazarların tartışmalar ile ilgili görüşlerini belirttiği makale türüdür. Doğrudan ya da davet edilen yazarlar tarafından hazırlanır. Derleme makale **giriş, yazar(lar) tarafından belirlenen alt başlıklar ve sonuç** bölümlerinden oluşur.

- Derleme makalede giriş ve sonuç bölümü dışındaki alt başlıklar yazar(lar) tarafından oluşturulur.
- Özet bölümsüz olarak, 200-250 kelimedenden oluşmalı, Türkçe ve İngilizce olarak hazırlanmalı ve en az 3, en fazla 5 kelimedenden oluşan anahtar sözcük içermelidir.
- Giriş bölümünde makalenin amacı ve dayandığı bilimsel düşünceler açık olarak ifade edilmeli; ortaya konan sorun dünyadaki ve Türkiye'deki hemşirelik ile ilişkilendirilmelidir.
- Metin içinde yer alan alt başlıklar makalenin amacı ve kapsamını karşılayacak şekilde düzenlenmeli; dünyada ve Türkiye'de hemşirelik alanında yapılanlar ve yapılabilecekler yazar(lar)ın görüşlerini de içerecek biçimde irdelenmelidir.

Sistemik Derleme

Sistemik derleme, meta-analiz yaklaşımında olduğu gibi ilgili bilim dallarına ve özellikle uygulama alanına en iyi kanıt sağlayan, bir çeşit ikincil (sekonder) araştırma çalışmasıdır. Bir derleme makalenin sistemik olarak tanımlanabilmesi için derlemeye alınacak çalışmaların belirlenmesi, seçilmesi, çalışma verilerinin sentezlenmesi süreçlerinin izlenmesi gerekmektedir. JTDN'ye gönderilecek olan sistemik derleme çalışmalarının da araştırma makalelerine benzer başlıklarla ele alınarak hazırlanması ve sisteme yüklenmesi gerekmektedir.

Olgu Sunumlari

Olgu sunumu, derginin kapsamına giren konularda özgün olguları/ vakaları rapor edecek şekilde ele alınmalıdır.

- Bu yazılar; **Kapak, Özet** (araştırma makalesinde belirtilen başlıklara yer vermeksizin en az 200- en fazla 250) ve **Anahtar Sözcükler** (Türkçe ve İngilizce, en az 3- en fazla 5 kelime), **Giriş, Olgu Sunumu, Tartışma ve Sonuç, Kaynaklar** bölümlerinden oluşmak üzere 3000 sözcüğü geçmemelidir.
- Giriş bölümünde konunun sağlık ve hemşirelik uygulamalarındaki yeri ve önemine değinilmelidir. Burada, olguya ait gerekli tüm ayrıntılar, sorunu ortaya koyacak ve okuyucunun düşünmesini sağlayacak şekilde ele alınmalı ve olgu sunumunun etik yönü açıklanmış olmalıdır.
- Olguya ilişkin gerektiğinde tablo ve açıklayıcı bilgilere yer verilmelidir.
- Tartışma bölümünde, olguda verilen sorulara tam olarak yanıt aranmış olmalı, sonuç ve öneriler bölümünde olguya ilişkin özellikle uygulamaya katkı sağlayacak çıkarımlarda bulunulmalıdır.
- Olgu sunumu bölümünde, olguya ait gerekli tüm detaylar en az 3-4 sorunu ortaya koyacak ve okuyucunun düşünmesini sağlayacak şekilde verilmeli ve olgu sunumunun etik yönü açıklanmış olmalıdır.
- Yeterli sayıda fotoğraflarla ve şemalarla desteklenmiş olmalıdır.

Editöryel Yorum

Yayınlanan orijinal araştırma makaleleri ile ilgili, araştırmanın yazarları dışındaki o konunun uzmanı tarafından değerlendirilmesidir. Konu ile ilgili makalenin sonunda yayınlanır.

Editöre Mektup

Son bir yıl içinde dergide yayınlanmış makalelere yanıt olarak gönderilir. Yazı hakkında okuyucuların farklı görüş, deneyim ve sorularını içerir. 500 kelimeyi, 5 kaynağı ve 2 yazar ismini geçmemelidir.

Yazar Katkisi

Yazar/yazarların makaleye sağladıkları katkı "COPYRIGHT TRANSFER AND AUTHOR CONTRIBUTION FORM"nda belirtilmelidir. Bölüm doldururken "Katkı Türü" kısmına ilgili numara/numaralar yazılmalıdır.

Teşekkür

Yazının sonunda kaynaklardan önce yer verilmelidir. Bu bölümde, çalışmaya kişisel, teknik ve materyal yardımı gibi nedenlerle katkı sağlayanlara yönelik teşekkür ifadelerine yer verilmektedir.

Kaynaklar

Türk Diyabet Hemşireliği Dergisi'nin yazım kuralları **Amerikan Psikoloji Derneği (APA)** yazım kuralları temel alınarak belirlenmiştir. (<http://www.apastyle.org>)

Kaynaklar dergi yazım kurallarına uygun olarak verilmelidir. Doğruluğundan yazarlar sorumludur. Birden fazla kaynak arka arkaya metin içinde gösterileceği zaman aralarında " ; " olmalı ve yıllara göre artarak sıralanmalıdır (Olgun, 2007; Gedik, 2008; Çelik, 2010). Aynı yazarın aynı yıl yayınlanmış iki farklı eserinden yararlanılmışsa ilgili kaynak metin içinde (Olgun, 2010a; 2010b) şeklinde verilmelidir. Kullanılan tüm kaynaklar **metin sonunda ayrı bir bölüm halinde, alfabetik olarak yazar soyadlarına göre, çift satır aralıklı** olacak şekilde sıralanmalıdır. Kaynakların makalede kullanılması ve gösterilmesinde uygun programların kullanılması önerilmektedir.

Metin İçinde Yazar veya Yazarlara Yapılan Atıf

Tek yazar

- Olgun (1982)'a göre
- (Olgun, 1982)

İki yazarlı

- Olgun ve Çelik (2020)'e göre (...)
- (Olgun ve Çelik, 2020)

Üç ile beş yazar arası

- İlk sefer atıf yaparken tüm yazarların adı listelenir; (Kernis, Cornell, Sun, Berry, ve Harlow, 2020)
- Sonraki atıflarda ise sadece ilk yazarın adı belirtilip "vd." ifadesi kullanılır (Kernis vd., 2020)

Altı ve daha fazla yazarlı metinlerde, sadece ilk yazarın adı kullanılıp sonrasında "vd." ifadesi kullanılır:

- Harris vd. (2021) ifade ettiği üzere (...)
- Harris vd. (2021)'ne göre (...)
- (Harris vd., 2021)

Yazar bir organizasyon veya hükümet kurumu ise, ilk atıfta olduğu gibi atıf yapılır; eğer çok bilinen bir kurum ise, sonraki kullanımlarda kısaltması tercih edilir:

- Amerikan Diyabet Derneği'ne (2020) göre.
- İlk atıf: (Mothers Against Drunk Driving [MADD], 2020)
- İkinci atıf: (MADD, 2020)

Aynı parantezde birden fazla esere atıfta bulunulduğunda, bunlar harf sırasına göre dizilmeli ve iki eser noktalı virgül ile ayrılmalıdır:

- (Akar, H. 2010; Çalışkan, 2008; Dinçer ve Kolaşın, 2009; Engin-Demir, 2009; Tunç, 2007)

Aynı soyisme sahip yazarlarda, karışıklığı önlemek için ismin ilk harfi de kullanılır:

- (E. Johnson, 2001; L. Johnson, 1998)

Aynı yazarın aynı yıl yayımlanan iki veya daha fazla eserine atıf yapılıyorsa; yıldan sonra (a, b, c) harfleri kullanılır:

- Berndt (1981a)'in çalışmasına göre (...)

Kişisel iletişim vasıtasıyla ulaşılan mülakatlar, mektuplar, e-maillerde, kişisel iletişim kurulan kişinin adı ve görüşmenin tarihi belirtilmelidir. Ancak, kişisel iletişim yoluyla elde edilmiş veriler kaynakçaya eklenmemelidir:

- (N. Olgun, kişisel iletişim, 25 Mart 2012)
- Olgun küreselleşme ve diyabet (...) (Kişisel iletişim, 25 Mart 2012)

Metin Sonunda Kaynak Gösterme

Temel İlkeler

Kaynaklar bölümünde kaynakların sıralanması yazar soyadlarına göre alfabetik olarak yapılmalıdır.

Tek yazar

- Berndt, T. J. (2002). Friendship quality and social development. Current Directions in Psychological Science, 11, 7-10.

İki yazar

- Wegener, D. T. ve Petty, R. E. (1994). Mood management across affective states: The hedonic contingency hypothesis. Journal of Personality and Social Psychology, 66, 1034- 1048.

Üç ile yedi yazar arası

- Kernis, M. H., Cornell, D. P., Sun, C. R., Berry, A., Harlow, T. ve Bach, J. S. (1993). There's more to self-esteem than whether it is high or low: The importance of stability of self-esteem. Journal of Personality and Social Psychology, 65, 1190-1204.

Yedi yazardan fazla ise; ilk altı yazarın adı listelendikten sonra üç nokta koyup son yazarın adı eklenir. Yedi isimden fazlası yer almamalıdır

- Miller, F. H., Choi, M. J., Angeli, L. L., Harland, A. A., Stamos, J. A., Thomas, S. T., ... Rubin, L. H. (2009). Web site usability for the blind and low-vision user. Technical Communication, 57, 323-335.

Organizasyonun yazar olduğu durumlarda

- American Diabetes Association. (2021).

Yazar bilinmiyorsa

- Merriam-Webster's collegiate dictionary (10. bs.). (1993). Springfield, MA: Merriam- Webster.

Aynı yazarın iki ve daha fazla çalışması kullanılmışsa; kaynaklar tarih sırasına göre dizilmelidir

- Berndt, T. J. (1981).
- Berndt, T. J. (1999).

Eğer yazar bir çalışmada tek yazar ve başka çalışmada ortak yazar ise, önce tek yazarlı olan çalışma listelenmelidir

- Berndt, T. J. (1999). Friends' influence on students' adjustment to school. Educational Psychologist, 34, 15-28.
- Berndt, T. J. ve Keefe, K. (1995). Friends' influence on adolescents' adjustment to school. Child Development, 66, 1312-1329.

Eğer bir yazarın farklı yazarla yayımladığı eserler varsa, sıralama alfabetik olarak ikinci veya sonraki isme bağlı olarak yapılır

- Wegener, D. T. Kerr, N. L., Fleming, M. A., ve Petty, R. E. (2000). Flexible corrections of juror judgments: Implications for jury instructions. Psychology, Public Policy, and Law, 6, 629-654.
- Wegener, D. T., Petty, R. E. ve Klein, D. J. (1994). Effects of mood on high elaboration attitude change: The mediating role of likelihood judgments. European Journal of Social Psychology, 24, 25-43.

Bir yazarın aynı yıl yayımlanmış iki veya daha fazla çalışması varsa, (a, b, c) gibi harfler kullanılır

- Berndt, T. J. (1981a). Age changes and changes over time in prosocial intentions and behavior between friends. Developmental Psychology, 17, 408-416.
- Berndt, T. J. (1981b). Effects of friendship on prosocial intentions and behavior. Child Development, 52, 636-643.

Giriş, önsöz ve sonsözlere, bir kitap bölümü gibi atıf yapılır

- Kumar, R.ve Hill, D.(2009). Introduction, : Neoliberal Capitalism and Educaiton. D. Hill ve R. Kumar (Der.). Global Neoliberalism and Education and its Consequences içinde (ss. 1-11). New York: Routledge.

Kaynak bir dergiden alınmış ise

- Yazar soyadı ve adının ilk harfi, basım tarihi, makalenin başlığı, derginin tam adı, cilt ve sayısı, ilk ve son sayfa numaraları yazılmalıdır.
- Örneğin, Gotzsche, P. (2000) Why we need a broad perspective on meta-analysis, BMJ 321,585-586.

Kurum adı veya yazarı belli olan kitabın kaynak gösterilmesi

- Kurum adı, ya da yazarın soyadı, adının baş harfi, basım yılı, makale başlığı, varsa makalenin alt başlığı, kitabın birden fazla baskısı varsa baskı sayısı, yayımlandığı yer, yayınevi mutlaka yer almalıdır.
- Örneğin; Whitehead, A.(1998). Science and the modern world. Free Pres, New York.

Editörlü bir kitabın bir bölümünden alıntı yapılmış ise

- Editör ve yazarın ayrıntılı bilgisi basım yeri verilmeli ve kaçınıcı basım olduğu belirtilmelidir. Türkçe kaynaklarda aynı şekilde editörü (Ed) ile kısaltarak belirtmeniz gerekmektedir.
- Örneğin, Olgun, N. (2002) Hipoglisemi ve hiperglisemi. S.Erdoğan (Ed.), Diyabet hemşireliği temel bilgiler. İstanbul: Yüce reklam/ yayım/dağıtım A.Ş.

Çeviri kitap ise

- Freud, S. (1970) An outline of psychoanalysis (J. Strachey, Trans.). New York: Norton. (Original work published 1940).

İnternet ortamından bir kitap ise

- Beers, M. H., Berkow, R. (1999). Mood disorders. In The Merck manual of diagnosis and therapy (17th ed., sec. 15, chap. 189). Retrieve January17,2003,from <http://www.merck.com/pubs/mmanual/section15/chapter189/189a.htm>

Tezler

- Çil Akıncı, A. (2008). KOAH'lı hastalara uygulanan pulmoner rehabilitasyonun fiziksel ve psikolojik parametrelere etkisi. Yayınlanmamış doktora tezi, Marmara Üniversitesi Sağlık Bilimleri Enstitüsü, İstanbul.

Elektronik ortamda elde edilen bir tez özeti ise:

- Embar- Seddon, A. R. (2000). Perceptions of violence in the emergency department. [Abstract]. Dissertation Abstracts International, 61 (02), 776A. Retrieved August 23, 2001, from <http://wwwlib.umi.com/dissertations/fullcit>

Bildiri sunumu:

- Olgun, N., Koçak Kaymaz, D. (Ağustos 2006) To be acquired of foot caring skill to the type 2 diabetic patients. FEND 11th Annual Conference, Kopenhag.

Kongre kitabında yayımlanan bildiri:

- Olgun, N. (2007) Diyabette vaka yönetimi. 9. Ulusal İç Hastalıkları Kongresi Kongre Kitabı. 5-9 Eylül 2007, Antalya, 328-29.

Elektronik ortamda kullanılan kaynak bir üniversite ya da web sayfasından alındı ise:

- Chou, L., McClintock, R., Moretti, F., Nix, D. H. (1993). Technology and education: New wine in new bottles: Choosing pasts and imagining educational futures. Retrieved August 24, 2000, from Columbia University, Institute for Learning Technologies Website: <http://www.ilt.columbia.edu/publications/papers/newwine1.html>.

Referans Listesi Örneği

- Alfred, G. J., Brusaw, C. T., & Oliu, W. E. (2009). The business writer's handbook. New York, NY: St Martin's Press.
- Barnard, R., de Luca, R., & Li, J. (2015). First-year undergraduate students' perceptions of lecturer and peer feedback: A New Zealand action research project. *Studies In Higher Education*, 40(5), 933–944. <https://doi.org/10.1080/03075079.2014.881343>
- Best, A. (2004). International history of the twentieth century. Retrieved from <http://www.netlibrary.com>
- Easton, B. (2008). Does poverty affect health? In K. Dew & A. Matheson (Eds.), *Understanding health inequalities in Aotearoa New Zealand* (pp. 97-106). Dunedin, New Zealand: Otago University Press.
- Kasabov, N., Scott, N. M., Tu, E., Marks, S., Sengupta, N., Capecci, E., . . . Yang, J. (2016). Evolving spatio-temporal data machines based on the NeuCube neuromorphic framework: Design methodology and selected applications. *Neural Networks*, 78, 1-14. <https://doi.org/10.1016/j.neunet.2015.09.011>
- Li, S., & Seale, C. (2007). Learning to do qualitative data analysis: An observational study of doctoral work. *Qualitative Health Research*, 17(10), 1442-1452. <https://doi.org/10.1177/1049732307306924>

- Rush, E., McLennan, S., Obolonkin, V., Cooper, R., & Hamlin, M. (2015a). Beyond the randomised controlled trial and BMI-evaluation of effectiveness of through-school nutrition and physical activity programmes. *Public Health Nutrition*, 18(9), 1578–1581. <https://doi.org/10.1017/S1368980014003322>
- Rush, E. C., Obolonkin, V., Battin, M., Wouldes, T., & Rowan, J. (2015b). Body composition in offspring of New Zealand women: Ethnic and gender differences at age 1–3 years in 2005–2009. *Annals Of Human Biology*, 42(5), 492–497.

Tablolar, Grafikler Ve Şekille

Kaynaklar bölümünden sonra, **her bir tablo, grafik, şekil ayrı bir sayfada yer almalıdır**. Her bir tablo, grafik, şekil bir sayfaya sığdırılmalı, gerekirse yazı aralığı ve karakteri küçültülmelidir. **Tablo başlıkları koyu ve küçük harfler ile üste, grafik ve şekillerin başlıkları ise alta yazılmalıdır**. Tablo içinde kullanılan kısaltmalar şekil, resim, tablo ve grafiklerin altındaki açıklamada belirtilmelidir.

Yazarlar İçin Gönderi Kontrol Listes

Makalenizi Türk Diyabet Hemşireliği Dergisi'ne göndermeden önce lütfen bu bölümdeki maddelerle karşılaştırarak eksik olmadığından emin olunuz.

- Kapak (Başlık) Sayfası
- Etik Kurul Kararı
- Yayın Hakkı Devir ve Yazar Katkı Formu
- Makalenin Metni (Tüm şekil, resim ve tablolar metnin sonunda yer almalıdır)

Revizyon ve Yayına Hazırlık

Yazarlar makalelerinin revizyon dosyalarını gönderirken, ana metin üzerinde yaptıkları değişiklikleri işaretlemelidir. Değişiklik yapılmış makaleler karar mektubunu takip eden bir ay içerisinde dergiye gönderilmelidir. Belirtilen süre içerisinde gönderilmeyen düzenlemelerin revizyon seçeneği iptal olabilir. Yazar(lar)ın revizyon için ek süreye ihtiyaç duymaları durumunda uzatma taleplerini bir aylık süre sona ermeden dergiye iletmeleri gerekmektedir. Değerlendirmeler sonucunda yayına kabul edilen makaleler intihal, dil bilgisi, noktalama ve biçim açısından kontrol edilir. Kabul edilen makalelerin mizanpaj ve dizgisinin yapılarak baskıya hazır PDF dosyaları sorumlu yazarlara iletilir ve yayın onaylarının dergiye iletilmesi istenir. Son olarak DOI numarasının verilerek yayınlanma aşamasına geçer.

Turkish Validity and Reliability Study of Patient Interpretation of Neuropathy Questionnaire

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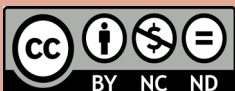
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Özet

Nöropati Hasta Yorumu Ölçeği'nin Türkçe Geçerlilik ve Güvenirliği

Amaç: Bu çalışma Nöropati Hasta Yorumu Ölçeği (NHYÖ)'nin Türkçe formunun geçerlilik ve güvenirliliğinin incelenmesi amacıyla metodolojik tipte gerçekleştirilmiştir.

Gereç ve Yöntem: Bu araştırma, 302 diyabet hastası ile yürütülen tanımlayıcı-metodolojik tipte bir çalışmadır. Verilerin toplanmasında NHYÖ ve Nottingham Fonksiyonel Ayak Bakımı Değerlendirmesi (NAFF) kullanılmıştır. NHYÖ Türkçe formunun geçerliliği; dil, kapsam, yapı ve ölçüt geçerliliği analizleri ile; güvenirliliği ise iç tutarlılık, madde analizi, test-retest ve paralel form güvenirliliği yöntemleri ile değerlendirilmiştir.

Bulgular: NHYÖ, çeviri-geri çeviri yöntemi kullanılarak Türkçeye uyarlanmıştır. Ölçeğin kapsam geçerlilik indeksi 0,96; iç tutarlılık güvenirlilik katsayısı ise 0,97 olarak bulunmuştur. Nöropati Hasta Yorumu Ölçeği'nin Türkçe formu 28 madde ve dört alt boyuttan oluşmaktadır. Bu dört alt boyut, toplam varyansın %75,79'unu açıklamaktadır. Ölçeğin test-retest güvenirliliğinde, iki uygulama arasındaki ilişki düzeyinin 0,735 ile 0,972 arasında değiştiği ve istatistiksel olarak anlamlı olduğu saptanmıştır ($p=0,001$).

Sonuç: NHYÖ'nün Türkiye'deki diyabetli bireylerin nöropati ile ilgili farkındalıklarını, tıbbi bilgileri anlama düzeylerini ve spesifik duygusal tepkilerini belirlemede geçerli ve güvenilir bir ölçüm aracı olduğu belirlenmiştir.

Anahtar Sözcükler: Diyabetik Periferik Nöropati; Geçerlilik; Güvenirlilik; Diyabet; Hemşirelik

Abstract

Objective: This study was conducted to examine the psychometric properties of the Turkish version of Patient Interpretation of Neuropathy (PIN) Questionnaire.

Method: This was a descriptive– methodological study conducted on 302 diabetes patients. In collecting the study data, PIN Questionnaire and the Nottingham Assessment of Functional Footcare (NAFF) were used. The validity of the Turkish form of PIN Questionnaire was evaluated through validity analyses based on language, content, construct, and criterion; the reliability of the Turkish form of PIN Questionnaire was assessed through internal consistency, item analyses, test-retest, and parallel form reliability.

Results: PIN Questionnaire was adapted to Turkish by using translation-backtranslation method. The scale's content validity index was found to be 0.96, while its internal consistency reliability coefficient was determined as 0.97. Turkish form of PIN Questionnaire consists of 28 items and four sub-dimensions. The four sub-dimensions recorded a variance of 75,79%. In test-retest reliability of the questionnaire, it was found that the correlation coefficient between two tests ranged between 0.735 and 0.972, which was statistically significant ($p=0.001$).

Conclusion: It was determined that PIN Questionnaire is a valid and reliable measurement tool for determining neuropathy-related awareness, level of understanding medical information, and specific emotional reactions of diabetic individuals in Turkey.

Keywords: Diabetic Peripheral Neuropathy; Validity; Reliability; Diabetes; Nursing

Notes: This study is derived from the master's thesis of the first author, Ozlem Eker Akpinar

Introduction

Peripheral neuropathy is a common neurological disease with various forms that results from certain hereditary diseases, various systemic diseases, infections, and medications because of a damage in the peripheral nervous system (Pop-Busui et al., 2017). The term diabetic neuropathy includes a variety of neuropathic conditions, but the most prevalent one among these is diabetic peripheral neuropathy (DPN) (Pop-Busui et al., 2022). DPN is the presence of peripheral nervous dysfunction symptoms in diabetic individuals following the exclusion of other reasons causing peripheral neuropathy (Pop-Busui et al., 2017).

The risk of peripheral neuropathy development in diabetic individuals is 55-70% (Pop-Busui et al., 2017; Feldman et al., 2019). DPN, which develops especially in lower extremities due to long-term hyperglycemia, leads to diabetic foot problem in diabetic patients as a result of immune disorder and angiopathy. Due to neuropathy-related disorder in sensing pain, skin dryness, not being able to perceive mechanical effects such as heat and cold and deep finger cut, and angiopathy developing in the veins, the development of ulcer and infections gains pace. When the ulcer is not immediately treated, osteomyelitis develops and necrosis occurs. When the whole foot is necrotized, amputation becomes inevitable (Amin & Doupis, 2016; Volmer-Thole & Lobmann, 2016).

When DPN has developed, symptoms and findings can be observed in patients such as decreased sensitivity to vibration and touching sensory stimulants in feet and toes, feeling of chill, feeling of burning that especially increases at night, difficulty with distinguishing heat variation, feeling of electric shock, and pain that starts from toes and progresses proximally (Ahmad, 2016; Bodman & Varacallo, 2023). In addition, due to dysfunction of sebaceous gland and sudoriferous gland, sweating and heat regulation functions deteriorate, and as a result, proneness to fractures and infection in the dried skin develops (Bodman & Varacallo, 2023; Zilliox, 2021).

Although there exist some treatment options for DPN today, an effective therapy is not available yet. Therefore, it is highly important to decrease DPN development risk, ensure glycemic control, and increase awareness of diabetic patients in this regard (Gandhi et al., 2022). In this context, patients can be informed and educated with a well-planned training program which aims to increase the awareness and information levels of diabetic patients regarding DPN starting from the diagnosis of diabetes. When the literature is examined, it has been stated that regular footcare habits play a significant role in preventing diabetic foot development (Pavithra et al., 2020; Adeyemi et al., 2021). Creation of training programs and patient training are among the most important preventive functions of nurses (Miranda et al., 2021).

It is believed that before planning the training program, it would be more useful to determine diabetic individuals' awareness of neuropathy, levels of understanding medical information, and specific emotional reactions regarding the issue. When the literature was reviewed in this regard, it was seen that although there were measurement tools in Türkiye that are used in foot self-care behaviors and information of diabetic patients, there was no measurement tool in Türkiye that could be used in order to determine diabetic individuals' awareness of neuropathy, their levels of understanding medical information, and their specific emotional reactions. Hence, the present study was conducted in order to test the validity and reliability of the Turkish form of Patient Interpretation of Neuropathy (PIN) Questionnaire which was developed by Vileikyte et al.

in order to identify diabetic individuals' awareness of neuropathy, their levels of understanding medical information, and their specific emotional reactions (Vileikyte et al., 2006).

Materials and Methods

The study was conducted with a methodological design in order to test language equivalence, validity, and reliability of PIN Questionnaire and to present it to Turkish society.

Individuals diagnosed with diabetes and diabetic peripheral neuropathy who were 18 years old and above, were able to communicate in Turkish both verbally and in writing, did not have verbal communication barrier due to disorders such as hearing, understanding, and speaking, and agreed to participate in the study were included in the study sample. In order to perform a factor analysis in scale studies, it is recommended that the sample size should not be lower than 5-10 times the number of the items on a scale (Alpar, 2022). In this context, as there are 39 items on PIN Questionnaire, it was aimed to reach a size 5-10 times the number of the items, and 302 individuals were accessed.

The study was conducted with the participation of diabetic individuals who presented to the neurology outpatient clinic of a city hospital in Istanbul between May - October 2022. The data were collected through Identifying Information Form, which included sociodemographic characteristics such as age, gender, marital status, education, occupation, income level, smoking, and alcohol use, characteristics related to the disease, and metabolic parameters, Patient Assessment of Neuropathy (PIN) Questionnaire, and the Nottingham Assessment of Functional Footcare (NAFF) scale.

Patient Interpretation of Neuropathy Questionnaire was developed by Vileikyte et al. (2006) in order to determine diabetic individuals' misconceptions of neuropathy, their levels of understanding medical information, and their specific emotional reactions (Vileikyte et al., 2006). The questionnaire consists of 39 items and 11 subscales, which are Good Circulation=Healthy Feet (Items 1, 2, 3, 4), Correct Interpretation of Neuropathy (Items 5, 6, 7), Ulcers Accompanied by Pain (Items 8, 9, 10), Physical Causes of Ulcers (Items 11, 12, 13, 14), Blaming Self/Practitioner (Items 15, 16, 17, 18), Acute Ulcer Onset (Items 19, 20, 21), Efficacy of Foot Self-Care (Items 22, 23, 24, 25, 26), Practitioner-Foot Ulcer Control (Items 27, 28, 29), Negative Aspects, Expected Results (Items 30, 31, 32, 33), Worrying About Consequences (Items 34, 35, 36, 37), and Anger at Practitioner (Items 38, 39). The scale items are scored on a 5-point Likert type scoring system, which are 1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, and 5=Strongly Agree. The score to be obtained from the questionnaire varies between 39-195 points. In the original scale study, the Cronbach's alpha reliability coefficients of the subscales range between 0.62 and 0.90 (Vileikyte et al., 2006).

The Nottingham Assessment of Functional Footcare was developed in 2007 by Lincoln et al. in order to be used in the evaluation of footcare. The Turkish validity and reliability study of the 26-item scale was conducted by Akyol and Ozdemir (Bolarinwa, 2015). In the study, the Cronbach's alpha coefficient of the scale was found to be 0.95.

Permission for the Turkish adaptation of PIN Questionnaire was taken from the authors of the questionnaire via e-mail. Before starting data collection, ethics board approval (E-46418926-050.99--108905) and institutional permission were obtained. The individuals who agreed to participate in the study were informed that their personal data would be kept

strictly confidential, their written consents were taken, and an interview of 45 minutes was held. In order to evaluate test-retest reliability of the questionnaire, the questionnaire was administered to the same patient group (N=30) again 30 days later. These patients were not included in the study sample.

The data obtained were analyzed by using Statistical Product and Service Solutions (SPSS 22.0). PIN Questionnaire was translated from English into Turkish by two linguistics specialists who were native speakers of Turkish and had good mastery of both languages and cultures and the researchers. In reliability analyses, the Cronbach's alpha coefficient was used. For validity analyses, factor analysis was employed. Compliance with factor analysis was evaluated with Bartlett's test. Adequacy of the sample size was evaluated through Kaiser-Mayer-Olkin (KMO) method. Significance level for all tests was determined as $p < 0.05$.

Results

The mean age of the diabetic individuals was 61.86 ± 9.16 years and the majority of them were female (56.6%). 76.5% of the participants were married, 62.9% had primary school education, and 40.4% were homemakers. It was also found that 42.4% received only diet therapy, 31.8% were taking oral anti-diabetic drugs, and 25.8% were using insulin (Table 1).

Table 1. Features of Participants			
Features		Min-Max	X±SD
Age (years)		38-79	61.86(9.16)
Diabetes duration (years)		1-35	9.69(7.30)
Hba1c (%)		5-16.30	7.66(2.06)
		n	%
Gender	Female	171	56.6
	Male	131	43.4
Marital status	Married	231	76.5
	Single	71	23.5
Education level	Primary school	190	62.9
	Secondary school	72	23.8
	High school	30	9.9
	Bachelor	10	3.3
Employment status	Housewife	122	40.4
	Retired	109	36.1
	Employee	71	23.5
Smoking	Yes	90	29.8
	Quit	72	23.8
	No	140	46.4
Alcohol	Yes	14	4.6
	Quit	38	12.6
	No	250	82.8
Complications of diabetes			
Diabetic retinopathy	Yes	144	47,7
	No	158	52,3
Diabetic nephropathy	Yes	70	23,2
	No	232	76,8
Cardiovascular disease	Yes	109	36,1
	No	193	63,9
Peripheral vascular disease	Yes	62	20,5
	No	240	79,5
Cerebrovascular disease	Yes	10	3,3
	No	292	96,7

The validity of the scale was evaluated through language, content, and construct validity analyses, while its reliability was assessed by using internal consistency, item analysis, and test-retest test reliability.

For linguistic validity, the scale was translated from English to Turkish by two linguists who were native speakers of Turkish and had a mastery of both languages and cultures and the researchers, and after comparing the translations and choosing the most appropriate statements, a single form was created. Then, the Turkish and English versions of the scale were presented to the expert opinions of 12 experts on internal diseases nursing, including 9 members of faculty, 2 specialist nurses, and 1 internal diseases specialist, and by making necessary corrections in line with the expert opinions, the final form of the Turkish version of the scale was created. In order to evaluate expert opinions, content validity index (CVI) was used (CVI:0.96).

In order to assess construct validity of the scale, exploratory factor analysis (EFA) was used. As a result of the analysis, 11 items which displayed distribution to multiple factors with factor load (Items 9, 10, 13, 14, 16, 18, 19, 22, 25, 28, 33) were removed from the scale. With the factor analysis performed again after this phase, optimal result was obtained. In order to examine factor structure, varimax rotation method was used and the findings are presented in Table 2. Following EFA performed over 28 items, KMO and Bartlett's tests were employed. The KMO value was found to be 0.92, while Bartlett's test result was determined as $\chi^2 = 14120.709$ ($p = .001$), indicating that the scale has an appropriate structure for factor analysis. As a result of EFA with varimax rotation, it was found that the factor loads of the items ranged between 0.524 and 0.882, and it was determined that four factors different from the original scale were obtained: F1 blood circulation and foot health (11 items), F2 worry about ulcer development (10 items), F3 attention and medical care (4 items), and F4 trust in health professionals (3 items).

In order to show the time invariance of the scale, test-retest test method was used, and the Cronbach's alpha coefficient and item analysis were used in order to measure internal consistency. For test-retest test analysis, PIN Questionnaire was applied two times with a 30-day interval to a group of 30 diabetic patients who met the inclusion criteria, and the data obtained were analyzed. When test-retest test results of PIN Questionnaire were evaluated based on the factors, it was determined that the correlation coefficients between two measurements/tests varied between 0.735 and 0.972, and that they were statistically significant ($p=0.001$) (Table 3). According to internal consistency analysis, the reliability coefficient (Cronbach's α) of the 28-item total scale was 0.97. Subscale reliability coefficients were found to be $\alpha = 0.94$ for F1, $\alpha = 0.96$ for F2, $\alpha = 0.95$ for F3, and $\alpha = 0.99$ for F4. In the item analysis, when an item was removed, the lowest Cronbach's α value was found to be 0.97. Item-total correlation coefficient was found to be at least 0.535. Hence, it was determined that all 28 items had high reliability.

Discussion

Factors that ensure more reliable results in studies are the validity and reliability of the scales used. Validity is a concept that determines the degree to which a measurement tool measures what it aims to measure and whether the statements included on the scale are appropriate for the purpose of a study. Different forms of validity have been defined such as construct validity, content validity, and item validity (Bolarinwa, 2015).

Table 2. EFA results of PIN Questionnaire				
Items	Factor Load Values			
	Blood circulation and foot health (F1)	Worry about ulcer development (F2)	Attention and medical care (F3)	Trust in health professionals (F4)
Lost or reduced feeling makes me angry about docs not telling me what is really going on with my feet.	0,661			
Lost or reduced feeling in my feet makes me worry about losing a leg.	0,643			
Lost or reduced feeling in my feet makes me worry about a foot ulcer (an open sore).	0,653			
Lost or reduced feeling makes me angry about docs who don't seem to care about me.	0,660			
Lost or reduced feeling in my feet makes me worry about a foot injury.	0,584			
Lost or reduced feeling in my feet makes me worry about what is going to happen next.	0,573			
Foot ulcers (open sores) can develop very fast.	0,562			
I can develop a foot ulcer (an open sore) at any time.	0,543			
If I had a foot ulcer (an open sore) I would get pain in my feet.	0,575			
Lost or reduced feeling in my feet could lead to injuries to my feet.	0,546			
Lost or reduced feeling in my feet could lead to foot gangrene.	0,524			
It is possible to have lost or reduced feeling and at the same time have pain in the feet.		0,780		
It is possible to have reduced feeling in the feet in spite of having sensitivity to touch.		0,770		
Removing hard skin (callus) can prevent foot ulcers (open sores) from occurring.		0,712		
Lost or reduced feeling means damage to the nerves in my feet.		0,710		
Good circulation in the feet means that I will not get foot ulcers (open sores).		0,655		
Lost or reduced feeling in my feet could lead to foot ulcers (open sores).		0,654		
Lost or reduced feeling means poor circulation in my feet.		0,649		
Good circulation in the feet means healthy feet.		0,640		
If the feet feel warm to the touch, it means healthy feet.		0,576		
Changes in foot shape can cause foot ulcers (open sores).		0,562		
Ill-fitting shoes can cause foot ulcers (open sores).			0,695	
Wearing shoes that fit properly can prevent foot ulcers (open sores) from occurring.			0,689	
Lost or reduced feeling in my feet was caused by poor medical care in the past.			0,588	
Foot ulcers (open sores) are caused by poor medical care.			0,582	
Diabetes doctors can prevent foot ulcers (open sores) from occurring.				0,822
Foot care specialists can prevent foot ulcers (open sores) from occurring.				0,822
Seeing my foot care specialist regularly can prevent foot ulcers from occurring.				0,820
Eigenvalue	17,957	1,450	0,975	0,845
Total Eigenvalue	21,227			
Explained Variance(%)	64,13	5,17	3,48	3,01
Total Explained Variance(%)	75,79			

Table 3. Re-test results and relationship between PIN Questionnaire and NAFF				
Scale and sub-dimensions	Re-test (30 patients)		NAFF	
	r	p	r	p
Blood circulation and foot health	0.917	0.001	0.941	0.001
Worry about ulcer development	0.864	0.001	0.870	0.001
Attention and medical care	0.735	0.001	0.859	0.001
Trust in health professionals	0.777	0.001	0.804	0.001
Total scale – PIN Questionnaire	0.972	0.001	0.956	0.001
r: Pearson correlations test				
NAFF: Nottingham Assessment of Functional Footcare				
PIN: Patient Interpretation of Neuropathy				

However, if a researcher does not develop a new scale and uses a scale that was previously adapted to the local language of the country where the study is conducted and the validity and reliability of which has been tested, it would be sufficient for the researcher to test the content and construct validity of the scale (Rubio, 2003).

Content validity, which is used in scale development or adaptation of a scale to a certain culture and language, helps to increase the quality of the statements on the scale and to determine the most suitable statements that would serve the purpose of the scale (Rubio, 2003). In this method, the researcher evaluates each statement on the scale in terms of content of the scale or appropriateness by consulting experts and makes necessary changes in line with the expert opinions (Polit & Beck, 2006). In this context, the items of the scale used were presented to the opinions of 12 experts, including 9 faculty members, 2 specialist nurses, and 1 internal diseases specialist. CVI value of the scale was calculated as 0.96, and as CVI was >80, it was concluded that the scale had content validity (Heale & Twycross, 2015). These findings showed that the items of PIN Questionnaire were applicable and represented the area that was aimed to be measured.

Construct validity is related with a measurement tool's degree of measuring a concept, behavior, idea, or quality – that is, a theoretical structure – that it aims to measure. The measurement tool having construct validity means that it proves the construct that is aimed to be measured (Rubio, 2003). The most used method in scale development and adaptation studies in order to obtain data on construct validity of a scale is factor analysis (Alpar, 2022). In the present study, construct validity was examined through EFA and confirmatory factor analysis (CFA).

Exploratory factor analysis is performed in order to determine under how many subheadings the items of a scale could be gathered and what type of relationship exists between them (Alpar, 2022). In the present study, construct validity of Patient Interpretation of Neuropathy questionnaire was examined in four steps, which are examination of suitability of the data for factor analysis, obtaining the factors, rotation of the factors, and naming the factors (Büyüköztürk, 2005).

In a scale development study, while factor analysis is being performed, first of all, it should be checked whether the scale data are suitable for factor analysis. For this purpose, the adequacy of the sample size should be considered. In order to evaluate the adequacy of the sample size, KMO coefficient and Bartlett's test are used in studies. KMO coefficient being higher than 0.60 and Bartlett's test data being significant indicate compliance with factor analysis (Johnson & Christensen, 2014). In the present study, KMO coefficient was determined to be 0.92, which showed that the sample size was adequate for factor analysis. Also, Bartlett's test result for Patient Interpretation of Neuropathy was statistically significant ($\chi^2=14120.709$; $p=0.001$), which indicated that the scale had a structure suitable for factor analysis.

It should also be noted that the factor loads of the items included in the factors should have a high factor load in one item and low factor load in the others. In this regard, it has been recommended that the difference between the factor which an item shows a high factor load and the factor load in a second factor should be at least 0.10. In addition, it has been recommended to remove the items that have high factor loads in more than one factor from the scale (Acar Güvendir & Özer Özkan, 2022).

In the present study, as a result of the EFA performed on the 39 items on the scale, 11 items (9, 10, 13, 14, 16, 18, 19, 22, 25, 28, 33),

which did not meet the item factor load value of 0.45 and overlapped as they had a factor load lower than the difference of 0.10 in more than one factors, were removed from the scale (Sürücü & Maslakçı, 2020). As a result of this process, in order to bring together the items that showed a high relationship in each factor, Varimax rotation analysis technique was used. Through Varimax rotation technique, it was seen that the remaining 28 items were distributed to 4 factors. According to the results obtained from rotated component matrix of the exploratory factor analysis, it was determined that 11 items were in Factor 1 (factor load values between 0.661-0.524), 10 items in Factor 2 (factor loads between 0.780-0.562), 4 items in Factor 3 (factors loads between 0.695-0.582) and 3 items in Factor 4 (factor loads between 0.822-0.820). Thus, as a result of all these processes, the final form of PIN Questionnaire which consisted of four factors and 28 items was obtained.

Confirmatory factor analysis is performed in order to provide evidence for the validity of the construct obtained as a result of EFA. EFA is a method used in order to identify whether a scale that was used in previous studies would fit the original factor structure when it is used in a current study, and if it is fit, to what degree it is fit (Koyuncu & Kılıç, 2019).

Goodness of fit index examined in CFA shows Chi-square (χ^2) fit statistic. In addition, the ratio of Chi-square (χ^2) fit statistic to the degree of freedom is examined, and this ratio being lower than 3 shows perfect fit, while a ratio lower than 5 indicates good fit (Çam & Arabacı, 2010). PIN Questionnaire's χ^2/df value being determined as 3.773 shows that the model is a model with good fit.

Reliability refers to the stability and time-dependent consistency of a measurement tool. In other words, the reliability of a scale is its ability to measure and give similar results when it is applied in different times. The reliability of PIN Questionnaire was evaluated through internal consistency, item analyses, test-retest test, and parallel form reliability. The minimum value for a measurement tool to be accepted as reliable in terms of internal consistency has been determined in the literature as 0.70. If the Cronbach's alpha (α) coefficient is in the range of $0.70 \leq \alpha < 0.80$, the scale is considered quite reliable, and if this value is within the range of $0.80 \leq \alpha \leq 1.00$, the scale is considered highly reliable (Sürücü & Maslakçı, 2020). In the present study, the Cronbach's alpha coefficient of PIN Questionnaire was found to be 0.979, which showed that the items on the measurement tool were homogenous and consistent, and the scale was highly reliable.

Time invariance is defined as the ability of a measurement tool to show consistency and stability between the first and second measurements under the same conditions and in a certain period (Osborne & Jason, 2015). In this context, PIN Questionnaire was applied to 30 participants included in the study sample of the present study twice with a 30-day interval. When test-retest test results of PIN Questionnaire were evaluated on the basis of factors, it was seen that the correlation coefficients between two measurements/tests varied between 0.735 and 0.972, and that the result was statistically significant ($p=0.001$). A positive and moderate to strong relationship was determined between the two measurements of PIN Questionnaire. Regarding the original PIN Questionnaire developed by Vileikyte et al. (2006), PIN Questionnaire was administered to 432 patients twice with a 30-day interval, and the correlation coefficients between the two measurements were reported to have varied between 0.51 and 0.64 (Vileikyte et al., 2006).

Parallel form reliability is the examination of the correlation between the scores obtained when two equivalently developed scales are applied to the same group (Vileikyte et al., 2006). In the present study, NAFF, whose validity and reliability study was conducted by Akyol and Ozdemir (2019), was used as a parallel form, and the relationship between the two measurements was evaluated through Pearson Moments Multiplication Correlation (Sürücü & Maslakçı, 2020; Akyol & Özdemir, 2019). As a result, a positive and statistically significant correlation was found between PIN Questionnaire total scale score and NAFF totals scale score ($r=0.961$; $p=0.001$). This finding suggested that these two measurement tools were similar.

Conclusions and Recommendations

As a result of the study, the Turkish form of PIN Questionnaire, which was developed in order to investigate diabetic individuals' awareness of neuropathy, levels of understanding medical information, and their specific emotional reactions, was determined to be a valid and reliable measurement tool.

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Validity and Reliability of the Turkish Version of the Diabetes Intention, Attitude and Behavior Questionnaire

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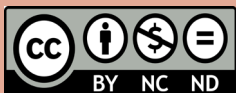
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Özet

Diyabet Niyet, Tutum ve Davranış Ölçeği' nin Türkçe Geçerlilik ve Güvenilirliği

Amaç: Bu çalışmanın amacı, Diyabet Niyet, Tutum ve Davranış Ölçeği'nin (DIAB-Q) Türkçe Formu'nun geçerlik ve güvenilirliğini değerlendirmektir.

Gereç ve Yöntem: Bu araştırma metodolojik bir çalışmadır. Araştırmanın örneklemini, Kasım 2020–Mayıs 2021 tarihleri arasında özel bir hastanenin Endokrin ve Metabolizma Hastalıkları Polikliniğine başvuran ve Tip 2 diyabet tanısıyla izlenen 125 hasta oluşturmuştur. Veriler; Hasta Bilgi Formu ve DIAB-Q Türkçe Formu ile toplanmıştır. Yapı geçerliliği için Doğrulamalı Faktör Analizi (DFA) uygulanmış; orijinal ölçeğin altı psikolojik yapısı test edilerek desteklenmiştir. Dil geçerliliği için çeviri–geri çeviri süreci kullanılmış ve uzman değerlendirmesiyle kapsam geçerlilik indeksi (KGI) 0.99 olarak hesaplanmıştır. Zamana karşı değişmezlik, 30 katılımcı üzerinde iki haftalık aralıklarla uygulanan test–tekrar test yöntemiyle Spearman korelasyon katsayıları ve eşleştirilmiş örneklem t testi kullanılarak değerlendirilmiştir.

Bulgular: DIAB-Q, altı psikolojik yapıyı içeren 17 maddeden oluşmaktadır. Ölçek alt boyutlarına ilişkin Cronbach alfa katsayıları 0.598 ile 0.896 arasında değişmektedir. Düzeltilmiş madde-toplam korelasyon değerlerinin tamamı 0.20'nin üzerinde olduğu belirlenmiştir. DFA sonuçlarında faktör yüklerinin 0.588 ile 0.903 arasında iyi düzeyde olduğu tespit edilmiştir. Eşleştirilmiş örneklem t testleri, iki ölçüm arasında hiçbir alt boyutta istatistiksel olarak anlamlı bir değişim olmadığını göstermiştir (tüm $p > 0.05$). Spearman korelasyon katsayıları ise iki ölçüm arasında istatistiksel olarak anlamlı ilişki olduğunu göstermiştir (tüm $p < 0.001$).

Sonuç: DIAB-Q'nun Türkçe versiyonunun, Tip 2 diyabetli bireylerde diyabetle ilişkili niyetleri, tutumları ve davranışları değerlendirmek için geçerli ve güvenilir bir araç olduğu bulunmuştur.

Anahtar Sözcükler: Tip 2 Diyabet; Öz-Yönetim; Geçerlik; Güvenirlik; Hemşirelik; Psikometri

Abstract

Objective: The aim of this study was to evaluate the validity and reliability of the Turkish version of the Diabetes Intention, Attitude and Behavior Questionnaire (DIAB-Q).

Method: This is a methodological study. The sample included 125 patients with a confirmed diagnosis of Type 2 Diabetes admitted to the Endocrine and Metabolic Diseases outpatient clinic of a private hospital between November 2020 and May 2021. Data were collected using a Patient Information Form and the DIAB-Q Turkish Form. Confirmatory Factor Analysis (CFA) was performed to assess construct validity; the six-factor first-level structure of the original instrument was tested and supported. Content validity was confirmed through a translation–back-translation process and expert panel review (CVI = 0.99). Temporal stability was assessed via test–retest analysis with 30 participants using a two-week interval, evaluated with Spearman correlation coefficients and paired-samples t tests.

Results: The DIAB-Q comprises 17 items across six psychological constructs. Subscale Cronbach's alpha coefficients ranged from 0.598 to 0.896. All corrected item-total correlation values exceeded 0.20. In the CFA, factor loadings ranged from 0.588 to 0.903, indicating good fit. Paired-samples t tests confirmed no statistically significant change in subscale scores across the two points (all $p > 0.05$), while Spearman correlations between the two measurements were all statistically significant (all $p < 0.001$).

Conclusion: The Turkish version of the DIAB-Q was found to be a valid and reliable instrument for assessing diabetes-related intentions, attitudes, and behaviors in individuals with Type 2 diabetes.

Keywords: Type 2 Diabetes; Self-Management; Validity; Reliability; Nursing; Psychometrics

Introduction

Diabetes Mellitus (DM) is a chronic metabolic disease characterized by hyperglycaemia, glycosuria and many accompanying clinical and biochemical findings, in which the organism cannot make adequate use of carbohydrates, fats and proteins due to impaired insulin release, insulin effect or both of these factors, leading to organ and function losses due to the complications it causes, affecting the duration and quality of life, having a heavy social and economic burden with workforce losses, requiring continuous care (TÜRKDİAB, 2025; IDF, 2025; ADA, 2026; Özgürsoy Uran & Ayhan, 2023). The 11th Diabetes Atlas, released by the International Diabetes Federation in 2025, reports that approximately 588 million individuals globally are affected by diabetes, with three-quarters residing in low- and middle-income countries. Diabetes is directly responsible for an estimated 3.4 million deaths annually. The incidence and prevalence of diabetes have consistently increased over recent decades. National statistics from 2021 reveal that 9.6 million people in Turkey were diagnosed with diabetes, and global projections indicate this figure may rise to 852 million by 2050 (IDF, 2025; Turkey Diabetes Programme, 2015-2020). While the idea that a patient diagnosed with diabetes will remain diabetic for years is a long-standing view, remission of the disease can be achieved with good treatment and care. Diabetes is a controllable disease with appropriate dietary adjustment, regular physical activity, weight control, lipid monitoring and appropriate drug therapy (Alam et al., 2021).

To ensure effective self-management, the motivation of individuals, including lifestyle change, is crucial. These behaviors include healthy eating, glucose control, physical activity, taking medication, problem solving, self-monitoring, reducing risks, and coping with problems (Ahmad & Joshi, 2023). Good self-care management in improving the quality of life of patients with Type 2 Diabetes and preventing complications requires research.

One of the goals of nurse-led, shared care is to encourage people with diabetes to be active participants in their own care. Providing individual management of the patient with diabetes helps to keep metabolic targets within the desired limits, prevent the occurrence and progression of complications, maintain good health, and improve quality of life. Education and empowerment are necessary for individuals to become active participants in their own care, to have independent decision-making skills and to use their coping and problem-solving skills in the face of problems. Studies have shown that lack of social and family support in the management of diabetes reduces motivation and effort towards self-management in diabetes. In conclusion, regular and continuous patient assessment is important for a good self-care management in improving the quality of life of patients with Type 2 Diabetes and preventing complications (Kıçaj et al., 2025).

When the literature was examined, a limited number of studies measuring patients' attitudes towards diabetes in Turkey were found. In addition, it is seen that the scales developed on this subject are limited. Our study was carried out in line with the reasons explained.

Type 2 diabetes is a complex condition that demands continuous self-management across multiple behavioral domains, including dietary adherence, physical activity, weight control, and medication use. Effectively supporting these behaviors requires valid and reliable measurement tools that can capture not only the behaviors themselves but also the psychological antecedents that drive them including intentions, attitudes

perceived behavioral control, and social norms. The Theory of Planned Behavior (TPB), which posits that behavioral intentions are the most proximal determinants of actual behavior, has been widely applied in diabetes self-management research as a framework for understanding and predicting health-related behaviors (Ahmad & Joshi, 2023). Measurement tools grounded in this theoretical framework are particularly valuable because they allow clinicians and researchers to identify modifiable psychological targets for intervention, rather than simply documenting behavioral outcomes after the fact.

Despite the growing body of research on diabetes self-management in Turkey, the availability of psychometrically sound, culturally adapted instruments remains limited. Many existing scales assess either behavioral outcomes or psychological constructs in isolation, without capturing the full motivational pathway from attitude formation to behavioral enactment. The Diabetes Intention, Attitude and Behavior Questionnaire (DIAB-Q), developed by Traina et al. (2016), addresses this gap by integrating all six TPB constructs, subjective norm, attitude, perceived behavioral control, intention, planning, and behavior, into a single, brief instrument specifically designed for individuals with Type 2 diabetes. Its focus on three clinically critical self-care domains, physical activity, dietary behavior, and weight management, makes it particularly relevant for the Turkish context, where the prevalence of Type 2 diabetes is high and nurse-led self-management education programs are increasingly central to chronic disease care. However, the cross-cultural validity of a measurement tool cannot be assumed; cultural values, linguistic conventions, and health literacy levels all influence how individuals interpret and respond to scale items (Cruchinho et al., 2024). It is therefore essential that instruments used in clinical and research settings be rigorously adapted and validated for the target population before use.

The aim of the study was to adapt the Diabetes Intention, Attitude and Behavior Questionnaire into Turkish and to conduct a reliability and validity study.

Materials and Methods

Type of the Study

This methodological study was conducted to adapt the Diabetes Intention, Attitude and Behavior Questionnaire into Turkish and to evaluate its validity and reliability.

Sample of the Study

The sample of the study included patients diagnosed with Type 2 Diabetes in a private hospital, followed up for at least one year, without other chronic diseases and who accepted participation. In scale validity and reliability studies, a sample of at least 5–10 times the number of scale items is recommended for factor analysis (Tavşancıl, 2010). Accordingly, the study was conducted with 125 patients. Inclusion criteria were; confirmed Type 2 Diabetes diagnosis, follow-up in Endocrine and Metabolism Clinics between November 2020 and May 2021, age 18 years or older, open communication, and provision of informed consent. Patients with acute complications, communication difficulties, or refusal to participate were excluded. A subsample of 30 patients was selected for test-retest reliability.

Data Collection Tools

The data collection tool used in the study consists of two parts. The first section included the information form on sociodemographic characteristics, and the second part included

the Diabetes Intention, Attitude and Behavior Questionnaire.

Patient Information Form: Developed by the researcher based on relevant literature (Ahmad & Joshi, 2023; Alam et al., 2021; Kiçaj et al., 2025), the form covers (1) sociodemographic characteristics (age, gender, educational status, marital status, employment status, living arrangements, occupation, income level), (2) disease-related characteristics (diabetes duration, HbA1c, comorbidities, treatment type, insulin use), and (3) disease compliance (treatment adherence, physician visit frequency, medication use, family support).

Diabetes Intention, Attitude and Behavior Questionnaire-DIAB-Q: This scale, referred to as the Diabetes Intention, Attitude and Behavior Questionnaire (DIAB-Q), was developed by Traina et. al. in 2016 as a tool to assess the self-care behaviors of patients with Type 2 Diabetes. The DIAB-Q was developed using the Theory of Planned Behavior to measure self-care behaviors that are particularly important for individuals with Type 2 Diabetes. Each item of the DIAB-Q is based on information from various literature sources as well as information from health professionals and patients. In developing content on self-care behaviors important for patients with Type 2 Diabetes, many guidelines were used as models, including validated scales such as the Summary of Diabetes Self-Care Activities (SDSCA), the Short Form-36, version 2 acute (SF-36) questionnaire and the Multidimensional Diabetes Questionnaire (MDQ).

The DIAB-Q was designed to assess both six psychological constructs related to physical activity, dietary behavior and weight loss and the following current behavioral patterns: 1) Subjective Norm (ie, social pressure that results from perceived expectations of family, friends, and health care professionals), 2) Attitude, 3) Perceived Behavioral Control (PBC), 4) Intention, 5) Planning, and 6) Behavior The DIAB-Q consists of 17 items including 6 psychological constructs Subjective Norm (items 5, 11 and 16), Attitude (items 4, 10 and 15), Perceived Behavioral Control (items 6, 12 and 17), Intention (items 2, 8 and 13), Planning (items 3, 9 and 14) and Behavior (items 1 and 7). Scale items are graded on a 7-point Likert scale and participants are expected to respond to each item from 1 to 7 (eg, from "strongly disagree" to "strongly agree" or from "not at all valuable" to "extremely valuable"). The raw scores are calculated as the sum of the scores obtained from the items. The scores are then evaluated on a scale of 0-100 points. In the scores obtained, higher scores indicate higher involvement in useful behavior. For example, higher Planning scores indicate a higher likelihood to plan to engage in self-care. Cronbach's reliability coefficient of the original scale was determined as 0.84 (Traina et al., 2016).

Translation and Cultural Adaptation

Permission was obtained from the original authors to adapt the DIAB-Q into Turkish. The adaptation followed established cross-cultural guidelines (Wild et al., 2005; ITC, 2017): (1) forward translation by two bilingual translators, (2) synthesis of translations, (3) back-translation by two independent translators, (4) expert panel review by five academics in nursing and midwifery from four institutions using Davis's (1992) four-point rating scale to calculate the Content Validity Index (CVI), and (5) pilot testing with 30 patients to assess item comprehensibility.

Ethics

Permission was obtained from the original authors to adapt the DIAB-Q into Turkish. Ethics committee approval was obtained from Demiroğlu Bilim University Clinical Research

Ethics Committee (13.10.2020, No: 44140529/423). All participants provided written informed consent.

Statistical Analysis

Confirmatory Factor Analysis (CFA) was performed to assess construct validity of the adapted scale, testing the six-factor first-level structure proposed by the original authors. Model fit was evaluated using multiple indices: χ^2/df , RMSEA (with 90% confidence interval), GFI, and AGFI (Hooper et al., 2008). Convergent validity was assessed via Average Variance Extracted (AVE) and Composite Reliability (CR), with thresholds of AVE ≥ 0.50 and CR ≥ 0.70 indicating acceptable convergent validity. Internal consistency was evaluated using Cronbach's alpha coefficients and corrected item-total correlations. Temporal stability was assessed using paired-samples t tests (to detect mean-level change across the two time points) and Spearman correlation coefficients (to evaluate the consistency of rankings across measurements). For between-group comparisons, independent samples t tests and one-way ANOVA were used when normality was met; Mann-Whitney U and Kruskal-Wallis H tests were applied otherwise. Analyses were performed using SPSS v25.0.

Results

The validity and reliability of the Turkish Form of the Diabetes Intention, Attitude and Behavior Questionnaire was carried out in line with the literature on the subject and the opinions of experts in this field.

Sociodemographic Characteristics of Patients

Among the 125 participants, 51.2% were female. The mean age was 63.52 \pm 13.12 years. Regarding educational attainment, 46.4% (n = 58) were high school graduates and 32.8% (n = 41) were university graduates. The majority were married (91.2%). Regarding living arrangements, 12% lived alone, 56% with their spouse, and 32% with their spouse and children (Table 1).

Table 1. Distribution of Patients According to Personal Characteristics (n=125)

Personal Characteristics	Category	n	%
Age	$\bar{x} \pm ss$ 63.52 \pm 13.123		
Gender	Female	64	51.2
	Male	61	48.8
Educational Status	Literate	6	4.8
	Primary School	20	16.0
	High school	58	46.4
	University graduate and above	41	32.8
Marital Status	Married	114	91.2
	Single	11	8.8
Economic Status	Moderately good	38	30.4
	Good	59	47.2
	Very Good	28	22.4
Persons with whom he/she lives	Alone	15	12.0
	With spouse	70	56.0
	With spouse and children	40	32.0

Psycholinguistic Properties and Content Validity Analysis of the Scale

Five expert academics in nursing and midwifery from four institutions evaluated each of the 17 items using Davis's (1992)

four-point rating technique. Minor wording adjustments were incorporated and approved by all experts. The CVI was calculated as 0.99, well above the 0.80 threshold, confirming content validity. Following expert review, a pilot study with 30 patients indicated all items were comprehensible, and no further modifications were required.

Internal Consistency Analysis

Subscale Cronbach's alpha coefficients were: Subjective Norm $\alpha = 0.896$; Attitude $\alpha = 0.724$; Perceived Behavioral Control $\alpha = 0.788$; Intention $\alpha = 0.671$; Planning $\alpha = 0.598$; Behavior $\alpha = 0.722$. All corrected item-total correlation values exceeded the 0.20 threshold, indicating adequate internal consistency. No item removal was found to produce a meaningful increase in subscale alpha.

Test-Retest Reliability

Test-retest analysis was conducted with 30 patients over a two-week interval. Two separate analyses were performed to evaluate temporal stability:

1. Paired-samples t tests assessed whether mean subscale scores changed significantly between the two measurement occasions. Results showed no statistically significant difference in any subscale (all $p > 0.05$), indicating stability of group-level scores over time (Table 2).

2. Spearman correlation coefficients assessed the consistency of individual rankings across the two time points. Correlations ranged from $r = 0.495$ to $r = 0.973$ and were all statistically significant (all $p < 0.001$), indicating adequate to excellent test-retest reliability at the individual level.

Note: For the Behavior subscale, the paired-samples t-test p-value is reported as 0.297 ($t = -1.061$), correcting an apparent transcription error in the raw data file (where a p value of 0.059 was listed against a t value inconsistent with that probability). The Spearman correlation for this subscale ($r = 0.973$, $p < 0.001$) confirms strong temporal stability at the individual level.

Scales and Subscales		Mean±SD	t	p (t-test)	r_s	p (r_s)
Subjective Norm	First test	87.22±14.23	-1.725	0.095	$r=0.670$	0.001*
	Retest	90.56±8.89				
Attitude	First test	87.96±8.64	-1.361	0.184	$r=0.966$	0.001*
	Retest	88.52±8.24				
Perceived Behavioral Control	First test	90.37±12.88	-0.992	0.330	$r=0.495$	0.001*
	Retest	92.41±7.51				
Intention	First test	82.78±12.91	0.117	0.908	$r=0.762$	0.001*
	Retest	82.59±12.18				
Planning	First test	84.63±10.18	0.941	0.354	$r=0.906$	0.001*
	Retest	83.89±9.49				
Behavior	First test	31.94±30.41	-1.061	0.297	$r=0.973$	0.001*
	Retest	38.06±26.50				

t: Paired-Samples t-test; r_s : Spearman's Correlation; * $p < 0.001$ (for correlation significance)

Validity Analysis Results-Confirmatory Factor Analysis

CFA was conducted to examine the hypothesized six-factor first-level structure of the DIAB-Q, comprising Subjective Norm, Attitude, Perceived Behavioral Control, Intention, Planning and Behavior, as proposed by Traina et al. (2016) (Figure 1). Factor loadings ranged from 0.588 to 0.903, all meeting the recommended minimum threshold of 0.50, supporting the factorial validity of the Turkish form (Table 3).

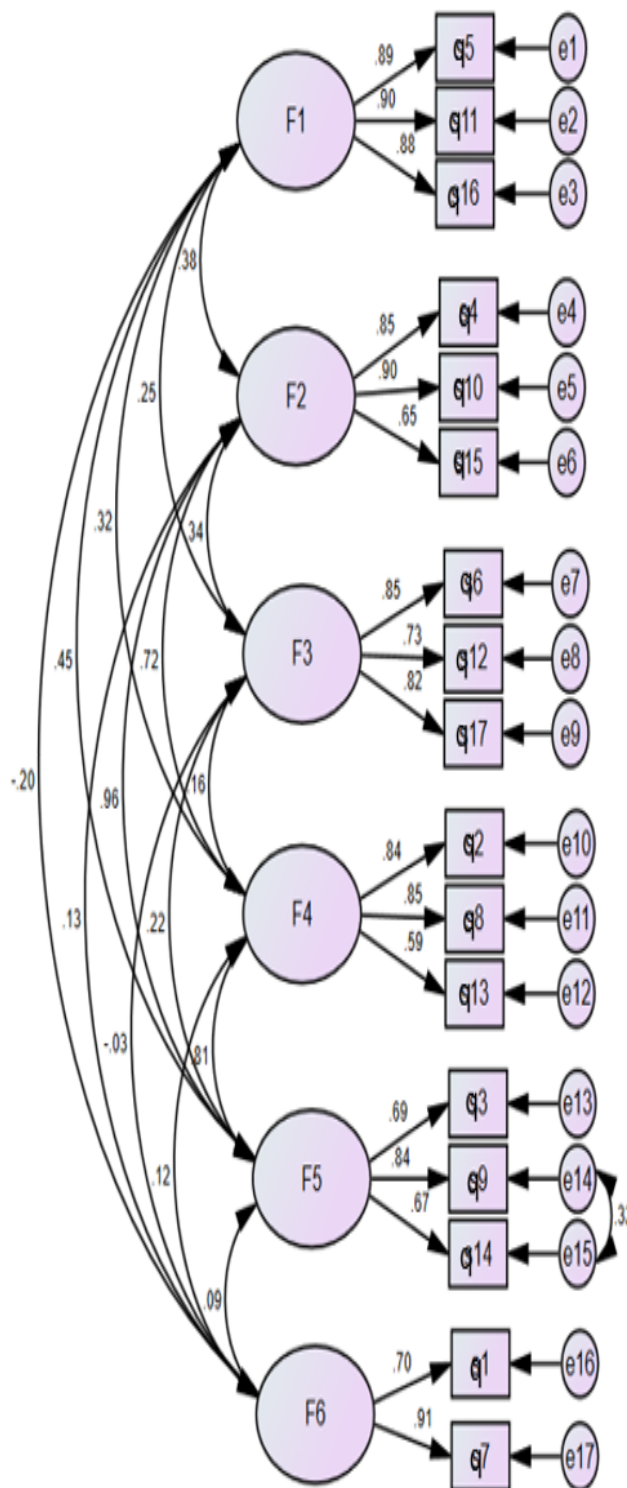


Figure 1. Model for the first level multifactor confirmatory factor analysis of the scale

Table 3. CFA Factor Loadings

Items		Factor	Factor Load	SE	CR (t)	p
Q5: My family, friends or health professionals expect me to exercise for the next 7 days.	<--	F1: Subjective Norm	0.893	-	-	-
Q11: My family, friends, or health professionals expect me to follow the diabetes diet for the next 7 days.	<--		0.903	0.086	11.707	0.001
Q16: My family, friends or health professionals expect me to lose some weight.	<--		0.877	0.075	10.933	<0.001
Q4: When I think about my diabetes care, exercising for me...	<--	F2: Attitude	0.853	-	-	-
Q10: When I think about my diabetes care, for me to follow a diabetes diet...	<--		0.895	0.094	9.705	0.001
Q15: When I think about my diabetes care, for me to lose some weight...	<--		0.645	0.110	5.901	0.001
Q6: Whether or not I exercise for the next 7 days is mostly up to me.	<--	F3: Perceived Behavioral Control	0.854	-	-	-
Q12: Whether or not I follow the diabetes diet for the next 7 days is mostly up to me.	<--		0.732	0.106	7.094	0.001
Q17: Whether I lose a little weight or not is mostly up to me.	<--		0.823	0.112	7.963	0.001
Q2: My desire to exercise for the next 7 days can be described as...	<--	F4: Intention	0.837	-	-	-
Q8: My willingness to follow the diabetes diet for the next 7 days can be described as...	<--		0.848	0.135	7.322	0.001
Q13: My desire to lose some weight can be described as...	<--		0.588	0.124	4.143	0.001
Q3: I made special plans to exercise for the next 7 days...	<--	F5: Planning	0.691	-	-	-
Q9: I made specific plans to comply with diabetes diet for the next 7 days.	<--		0.836	0.137	6.478	0.001
Q14: I made special plans to lose some weight.	<--		0.665	0.152	4.392	0.001
Q1: How many days did you exercise in the last 7 days?	<--	F6: Behavior	0.701	-	-	-
Q7: How many days in the last 7 days did you follow your diabetes diet?	<--		0.914	0.625	2.597	0.001

Table 4. CFA Model Fit Indices

Index	Perfect Fit Criterion	Acceptable Fit Criterion	Model Fit Value	Result
χ^2/df	$0 \leq \chi^2/df \leq 2$	$2 < \chi^2/df \leq 5$	1.64	Perfect fit
RMSEA	$0.0 \leq RMSEA \leq 0.05$	$0.06 \leq RMSEA \leq 0.08$	0.072	Acceptable fit
GFI	$0.90 \leq GFI$	$0.80 \leq GFI$	0.84	Acceptable fit
AGFI	$0.90 \leq AGFI$	$0.80 \leq AGFI$	0.80	Acceptable fit

χ^2/df : Chi-Square / Degrees of Freedom; RMSEA: Root Mean Square Error of Approximation; GFI: Goodness of Fit Index; AGFI: Adjusted Goodness of Fit Index

Table 5. Convergent Validity: Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE)

Subscale	Cronbach's α	CR	AVE	\sqrt{AVE}
Subjective Norm	0.896	0.92	0.79	0.89
Attitude	0.724	0.85	0.65	0.81
Perceived Behavioral Control	0.788	0.84	0.64	0.80
Intention	0.671	0.81	0.59	0.77
Planning	0.598	0.78	0.54	0.73
Behavior	0.722	0.79	0.66	0.81
Threshold for acceptance	≥ 0.50	≥ 0.70	≥ 0.50	-

Model fit indices are presented in Table 4. The χ^2/df ratio of 1.64 indicated perfect fit. RMSEA = 0.072, GFI = 0.84, and AGFI = 0.80 all indicated acceptable fit according to established criteria (Hooper et al., 2008). Modification indices were examined and covariance paths between theoretically related error terms were added iteratively; the final model achieved the fit values reported above.

Convergent Validity

Convergent validity was assessed using AVE and CR per subscale (Table 5). All six subscales met the criteria of AVE \geq 0.50 and CR \geq 0.70. AVE values ranged from 0.54 to 0.79 and CR values from 0.78 to 0.92. The square root of AVE (\sqrt{AVE}) values ranged from 0.73 to 0.89, further supporting convergent validity.

Discussion

The present study addressed a meaningful gap in the Turkish diabetes nursing literature by adapting and validating the DIAB-Q for use with Turkish-speaking patients with Type 2 diabetes. In Turkey, where approximately 9.6 million individuals are living with diabetes and the burden of the disease is projected to increase substantially by 2050 (IDF, 2025), the need for culturally appropriate, theory-based assessment tools is pressing. Without such tools, the effectiveness of nursing interventions cannot be properly evaluated, and the psychological barriers to self-management remain underexplored in the Turkish population.

The DIAB-Q is particularly well-suited to this purpose because it operationalizes the Theory of Planned Behavior, a framework with robust empirical support in the diabetes self-management literature. Studies have consistently demonstrated that behavioral intentions, shaped by attitudes, subjective norms, and perceived behavioral control, are significant predictors of self-care behaviors in individuals with Type 2 diabetes (Ahmad & Joshi, 2023; Kışaj et al., 2025). By measuring all six TPB constructs simultaneously, the DIAB-Q enables nurses and researchers to identify which specific psychological factors are undermining self-management in a given patient or population whether it is a lack of motivation, perceived social pressure, low self-efficacy, or an absence of concrete planning and to tailor interventions accordingly. The scale's brevity, 17 items covering six constructs, also makes it feasible for routine clinical use where time constraints limit the use of longer assessment batteries (Traina et al., 2016).

The decision to adapt this instrument specifically for the Turkish context was guided by the recognition that cultural factors profoundly shape the experience and management of diabetes. In Turkey, family involvement in health decisions is often central, and the role of social norms, captured in the DIAB-Q's subjective norm subscale may carry particular weight in influencing self-care behaviors. Similarly, dietary practices and attitudes toward physical activity are culturally embedded and may not map directly onto the assumptions underlying instruments developed in Western populations (Arafat, 2016; Cruchinho et al., 2024). The rigorous adaptation process employed in this study, encompassing expert panel review, forward and backward translation, content validity assessment, and pilot testing, was designed precisely to ensure that the Turkish version of the DIAB-Q retains the conceptual equivalence of the original while remaining linguistically natural and culturally resonant for Turkish patients.

It is recommended that cross-cultural scale adaptation

studies should be examined in two stages: psycholinguistic (language adaptation) and psychometric (reliability and validity) properties (Cruchinho et al., 2024). Measurement tools used to assess health behaviors of individuals are expected to be sensitive, valid, and reliable, whether they are laboratory diagnostic tests or psychometric measurement tools. Since health knowledge, attitudes and behaviors are shaped according to the cultural environment of the individual, psychometric measurements and data reliability are ensured by using a set of guidelines and algorithms. In the Turkish adaptation of the Diabetes Intention, Attitude and Behavior Questionnaire, the scale was accepted as valid and reliable after psycholinguistic and psychometric (Cronbach's alpha coefficient, CFA, and test-retest) analyses.

In order to ensure both cultural and linguistic equality in scale adaptation studies, it is recommended to use many analysis methods (Cruchinho et al., 2024). According to the recommendations, the first step is to analyze psycholinguistic features. There are at least four criteria for psycholinguistic evaluation: group translation with at least two people, back translation with at least two people, expert opinion, and pilot study of the test to a small group before the test is conducted (ITC, 2017; Lima Barroso et al., 2018). In our study, opinions were requested from a total of five people in accordance with these items. The experts were asked to mark one of 4 ratings for each of the 17 items in the form. As a result of the evaluations made by the expert group, suggestions were made at the word level in some items. The items of the scale were revised by using expressions appropriate to the suggestions, and the final version of the scale was approved by all experts.

The rigorous adaptation process employed in this study, encompassing expert panel review, forward and backward translation, content validity assessment with CVI = 0.99, and pilot testing, was designed to ensure that the Turkish version retains the conceptual equivalence of the original while remaining linguistically and culturally appropriate for Turkish patients.

Subjective Norm Subscale

The finding that the subjective norm subscale demonstrated the highest reliability coefficient ($\alpha=0.896$) in the Turkish adaptation is particularly noteworthy and may reflect the culturally distinctive role of family and social environment in diabetes self-management in Turkey. In Turkish society, health-related decisions are often deeply embedded in family structures, and the expectations of family members, friends, and healthcare professionals carry significant motivational weight. This observation is consistent with the literature demonstrating that social support from family members is strongly associated with self-care behaviors and glycemic control in patients with Type 2 diabetes (Stenberg & Hjelm, 2024). Furthermore, studies conducted specifically in Turkish populations have shown that family involvement and perceived social norms are central determinants of diabetes self-management adherence (Cokluk & Tokovska, 2023). The relatively high reliability of this subscale in the Turkish sample, compared with the original scale by Traina et al. (2016) in which perceived behavioral control was the most reliable subscale, suggests that the social normative dimension of diabetes behavior may be more salient in collectivist cultural contexts such as Turkey than in individualistic Western settings.

Attitude Subscale

The attitude subscale ($\alpha=0.724$) demonstrated

acceptable reliability, consistent with findings from cross-cultural adaptations of TPB-based instruments in diabetes populations. Research has consistently shown that positive attitudes toward self-care behaviors, including physical activity, dietary adherence, and weight management, are significant predictors of behavioral intention in individuals with Type 2 diabetes. A structural equation modeling study demonstrated that attitude was a significant predictor of behavioral intention ($\beta=0.161$, $p<0.01$), which in turn directly predicted self-management behavior (Wild et al., 2005; Chen et al., 2023). Similarly, TPB-based educational interventions targeting attitude change have been shown to produce significant improvements in self-care behaviors and health literacy among patients with Type 2 diabetes (Morshedi et al., 2021). These findings underscore the importance of including attitude measurement as a core component of diabetes assessment tools, and support the clinical relevance of the attitude subscale in the Turkish DIAB-Q.

Perceived Behavioral Control Subscale

The perceived behavioral control (PBC) subscale demonstrated good reliability ($\alpha=0.788$) in the Turkish adaptation. PBC, reflecting an individual's belief in their ability to perform a specific behavior, has been identified as one of the strongest predictors of both intention and actual self-management behavior in patients with Type 2 diabetes. Research has shown that PBC had a direct effect on self-management behavior ($\beta=0.259$, $p<0.001$) as well as an indirect effect through behavioral intention, indicating that the impact of perceived behavioral control on self-management was stronger than the effect mediated through intention alone (Chen et al., 2023). This finding is clinically important: patients who perceive they have control over their exercise, diet, and weight management are more likely to engage in these behaviors regardless of their stated intentions, suggesting that nursing interventions should specifically target self-efficacy enhancement alongside motivational strategies. Structured nursing intervention programs incorporating assessment, planning, implementation, and review stages have demonstrated effectiveness in developing self-management skills and empowerment in patients with Type 2 diabetes (Ibrahim et al., 2024).

Intention and Planning Subscales

The intention ($\alpha=0.671$) and planning ($\alpha=0.598$) subscales demonstrated acceptable reliability, though these were the lowest among the six subscales. This pattern is consistent with findings in the broader TPB literature, where planning constructs tend to show greater variability across populations and cultural contexts. Research applying the reasoned action approach to diabetes self-management behaviors has demonstrated that all behaviors, physical activity, diet, and blood glucose monitoring, were significantly predicted by intention, action planning, and coping planning, highlighting the importance of both motivational and volitional phases of behavior change (St Quinton, 2022). The relatively lower reliability of the planning subscale in this study may reflect the greater sensitivity of planning behaviors to contextual factors such as daily routine, living arrangements, and available social support, all of which vary considerably among Turkish patients with Type 2 diabetes. Future studies using the Turkish DIAB-Q should examine whether planning scores are differentially associated with self-management outcomes across patient subgroups defined by age, education, and living situation.

Behavior Subscale

The behavior subscale ($\alpha=0.722$) showed acceptable reliability. Notably, this subscale demonstrated a different pattern of association with the other constructs compared with the original scale — specifically, a negative correlation between the behavior subscale and the other five subscales was observed. This finding may reflect the well-documented "intention-behavior gap" in health psychology, whereby high intentions, positive attitudes, and strong perceived control do not always translate directly into consistent behavioral performance. Studies have highlighted that continuous monitoring and peer support are essential to maintaining participant engagement and commitment in diabetes self-management programs, suggesting that behavioral enactment requires ongoing reinforcement beyond motivational readiness (Ibrahim et al., 2024). In clinical practice, this pattern underscores the value of the DIAB-Q as a diagnostic tool: patients with high scores on attitude, subjective norm, and PBC subscales but low behavioral scores may represent a priority group for targeted nursing interventions focused on action planning, barrier identification, and behavioral follow-up.

Comparison with Original Scale

Sub-dimension reliability coefficients in this study were: Subjective Norm $\alpha = 0.896$; Attitude $\alpha = 0.724$; Perceived Behavioral Control $\alpha = 0.788$; Intention $\alpha = 0.671$; Planning $\alpha = 0.598$; Behavior $\alpha = 0.722$. These values compare favorably with the original scale by Traina et al. (2016), whose pre-test-retest subscale alphas were: Subjective Norm 0.66, Attitude 0.63, Perceived Behavioral Control 0.68, Intention 0.46, Planning 0.61, and Behavior 0.30. The improved reliability coefficients in the Turkish adaptation, particularly for the Behavior subscale, may be attributable to sample characteristics, cultural differences, and translation refinements. Quantitative and qualitative differences between the two samples ($n = 125$ vs. $n = 1,015$) and variation in educational and cultural background are also likely contributing factors.

Test-Retest and Temporal Stability

Test-retest analysis was conducted with 30 patients at a two-week interval. Although some methodological guidelines recommend a retest interval of two to four, the 14-day interval used in this study is widely accepted in the scale adaptation literature and is consistent with the practice of many published Turkish validation studies. Paired-samples *t* tests confirmed no statistically significant change in any subscale over time (all $p > 0.05$), and Spearman correlation coefficients were all statistically significant (all $p < 0.001$), indicating adequate temporal stability.

According to the results of the analysis in this study, there was a significant positive correlation between all score types of the DIAB-Q scale and a significant negative correlation only in one of them. According to this result, as the frequency of performing health improvement behaviors such as weight loss, diet adherence and exercise increases, there is an increase in performing actions in dimensions such as subjective norm, attitude, perceived behavioral control, intention and planning, and a decrease in the behavioral dimension.

Conclusions and Recommendations

The Turkish adaptation of the Diabetes Intention, Attitude and Behavior Questionnaire, with its 17-item six-subscale structure, was found to be a valid and reliable measurement tool

for use in Turkey. The scale demonstrated acceptable psycholinguistic and psychometric properties, including language validity, content validity, internal consistency, and temporal stability. It is recommended for use in clinical and research settings to evaluate the intentions, attitudes, and behaviors of individuals with Type 2 Diabetes in the Turkish context.

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Complementary and Alternative Medicine Use, Self-Care, and Factors Affecting These in Patients with Diabetes

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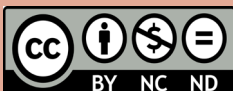
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Özet

Diyabetli Hastalarda Tamamlayıcı ve Alternatif Tıp Kullanımı, Öz Bakım ve Bunları Etkileyen Faktörler

Amaç: Bu çalışma, diyabet hastalarında tamamlayıcı ve alternatif tıp (CAM) kullanımı, kendine bakım düzeyleri ve bunları etkileyen faktörleri belirlemeyi amaçlamıştır.

Gereç ve Yöntem: Bu tanımlayıcı kesitsel çalışma 83 hasta ile gerçekleştirilmiştir. Veriler Kişisel Bilgi Formu, Diyabet Öz Bakım Ölçeği ve Tamamlayıcı ve Alternatif Tıp Yaklaşımları Ölçeği kullanılarak toplanmıştır.

Bulgular: En sık tercih edilen tamamlayıcı ve alternatif tıp yöntemleri manevi yaklaşımlar (dua %91,6; namaz %81,9) ve bitkisel yaklaşımlar (bitki çayları %77,1) olmuştur. Hastanede kalış süresi ve bitkisel, beslenme ve manevi yaklaşımların kullanım düzeyleri arttıkça, diyabet öz bakım düzeyinin de önemli ölçüde arttığı belirlenmiştir ($p<0,05$). Ayrıca, kontrollerini düzenli yaptıran, kan glukozunu izleyen ve düzenli ayak bakımı yapan bireylerin öz bakım düzeylerinin daha yüksek olduğu saptanmıştır.

Sonuç: Diyabetli hastalarda CAM kullanımı ile öz bakım düzeyi arasında pozitif bir korelasyon bulunmaktadır. Hastalar, öz bakım süreçlerini desteklemek için manevi ve bitkisel yöntemleri yaygın olarak kullanmaktadır. Sağlık profesyonellerinin, hastaların öz bakımını değerlendirirken bu geleneksel yönelimleri dikkate almaları önerilmektedir.

Anahtar Sözcükler: Diyabet; Öz Bakım; Tamamlayıcı ve Alternatif Tıp

Abstract

Objective: This study aimed to determine the use of complementary and alternative medicine (CAM), self-care levels, and the factors affecting these among patients with diabetes.

Method: This descriptive cross-sectional study was conducted with 83 patients. Data were collected using a Personal Information Form, the Diabetes Self-Care Scale, and the Complementary and Alternative Medicine Approaches Scale.

Results: The most frequently preferred CAM methods were spiritual approaches (Prayer 91.6%, Performing Salah 81.9%) and herbal approaches (Herbal teas 77.1%). It was determined that as the duration of hospital stay and the levels of herbal, nutritional, and spiritual approach use increased, self-care levels also significantly increased ($p<0.05$). Furthermore, individuals who had regular check-ups, monitored blood glucose, and performed regular foot care exhibited higher self-care levels.

Conclusion: There is a positive correlation between CAM use and self-care levels in patients with diabetes mellitus. Patients extensively utilize spiritual and herbal methods to support their self-care processes. It is recommended that healthcare professionals consider these traditional orientations when assessing patient self-care.

Keywords: Diabetes; Self-Care; Complementary Therapies

Introduction

Diabetes is a chronic disease affecting millions of people worldwide. This lifelong condition can significantly impact individuals' quality of life (Abejew et al., 2015). While modern medicine plays a crucial role in the treatment of diabetes, the incomplete cure and management of side effects have led to an increased interest in complementary and alternative medicine (CAM). These methods include herbal treatments, multi-vitamin support, acupuncture, and other natural treatment approaches (Grossman et al., 2018; Bausell et al., 2001).

The reasons for using complementary and alternative therapy methods stem from individuals seeking more natural and side-effect-free solutions in addition to modern medical treatments. These therapy methods are thought to alleviate the symptoms of diabetes, improve quality of life, and contribute to the management of the disease (Bausell et al., 2001; Song et al., 2017; Alzahrani et al., 2021; Ali-Shtayeh, Jamous, & Jamous, 2012).

Self-care level refers to the ability of individuals to manage their own health status and actively participate in treatment processes. Enhancing the self-care level of diabetes patients is vital for maintaining blood glucose levels, reducing the risk of complications, and improving the quality of life. High self-care level enables patients to be more successful in their treatment processes and reduces their need for healthcare services (Adhikari Baral & Baral, 2021; Adams et al., 2021). Research has shown that CAM methods have positive effects on increasing the self-care behaviors and quality of life in patients with diabetes (Lee, Pittler, & Ernst, 2008; Radwan et al., 2020).

The management of diabetes is not limited to medical treatments alone. A multidisciplinary approach is required to improve patients' quality of life and minimize the adverse effects of the disease. Complementary and alternative therapy methods constitute an essential part of this multidisciplinary approach. These methods may support patients' self-management and contribute to improved quality of life (Yeh, Eisenberg, Davis, & Phillips, 2002).

In light of this information, this study aims to determine the use of complementary and alternative therapies, the levels of self-care level, and the factors affecting these among diabetes patients.

Materials and Methods

This cross-sectional descriptive study collected data through face-to-face interviews with individuals diagnosed with Type 2 diabetes who presented to a Hospital in Gümüşhane between November 1, 2023, and June 1, 2024. The sample consisted of 83 patients. The inclusion criteria for the study were: willingness to participate in the study, ability to speak Turkish, and no communication problems. Individuals who met the inclusion criteria for the study and agreed to participate were included in the study during the specified time period.

Data were collected using a personal information form, the Diabetes Self-Care Scale, and the Complementary and Alternative Medicine Approaches Scale.

Personal Information Form: This form, created by the researchers, consists of 11 questions related to socio-demographic characteristics (age, gender, etc.) and 10 questions related to disease characteristics.

Diabetes Self-Care Scale (DSCS): Developed by Lee and Fisher, this Likert-type scale consists of 35 items with a Cronbach's alpha value of 0.80 (Lee & Fisher, 2005). The Turkish validity and reliability of the scale were conducted by

Karakurt and Kaşıkçı in 2015. The scale does not have sub-dimensions or reverse items. The maximum score obtainable from the scale is 140, with higher scores indicating better self-care activities. The Cronbach's alpha coefficient of the Turkish version of the scale is 0.81 (Karakurt & Kaşıkçı, 2015).

Complementary and Alternative Medicine Approaches Scale (CAMAS): This scale was developed by Can et al. in 2009. It consists of 55 items and has five sub-groups: herbal approaches (29 items), biological approaches (3 items), nutrition (14 items), religious practices (5 items), and cognitive-behavioral therapies (5 items). Each item is scored as "0" if the patient does not use or apply the approach and "1" if they do. The total score for each sub-dimension is calculated by summing the item scores within that sub-dimension, and the total score of the scale is obtained by summing the sub-dimension scores (Can et al., 2009).

Statistical Analysis

Descriptive methods (mean, standard deviation, median, frequency, and percentage) were applied in the evaluation of the study data. T-test, one-way ANOVA, Pearson Correlation, and Spearman Correlation analyses were used for data analysis. The results were expressed with a 95% confidence interval, and significance was determined at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the Scientific Research and Publication Ethics Committee of Gümüşhane University to conduct the study. Necessary institutional permissions were obtained. Written and/or verbal informed consent was obtained from all participants before data collection.

Results

The average age of the patients was 63.58 ± 13.80 years, with 65.1% being female. Of the participants, 80.7% were married, 31.3% had completed primary school, and 59.0% were housewives. Additionally, 21.7% of the patients smoked, with an average daily cigarette consumption of 1.78 ± 0.41 cigarettes. Furthermore, 4.8% of the patients consumed alcohol (Table 1).

The average duration since the patients were diagnosed with diabetes was 127.99 ± 101.41 months, and the average hospital stay was 3.34 ± 1.68 days. It was found that 98.8% of the participants regularly took their medication, 68.7% underwent regular health check-ups, and 31.3% had irregular health check-ups. Additionally, 65.1% of the patients regularly monitored their blood glucose, 25.3% engaged in regular exercise, 13.3% performed regular foot care, whereas 86.7% did not (Table 2).

The mean total score of the DSCS was 78.28 ± 10.31 , while the mean total score of the CAMAS was 17.92 ± 3.19 . When examining the sub-dimension mean scores of this scale, it was observed that no patients used biological agents. The mean total score for the herbal approach sub-dimension was 6.11 ± 2.45 , for the nutritional approach sub-dimension it was 9.57 ± 1.65 , for the spiritual approach sub-dimension it was 1.89 ± 0.86 , and for the cognitive approach sub-dimension it was 0.34 ± 0.52 .

The distribution of CAM use among participants is presented in Table 3. The most frequently utilized CAM method was found to be spiritual approaches, specifically individual prayer (91.6%) and performing salah (81.9%). Regarding herbal and nutritional approaches, the use of herbal teas (77.1%) and natural foods (69.9%) like honey or molasses were highly prevalent. In contrast, more specialized techniques such as acupuncture, meditation, and leech therapy were rarely used (1.2% each).

Table 1. Socio-demographic Characteristics

	n	%
Gender		
Female	54	65,1
Male	29	34,9
Marital Status		
Married	67	80,7
Single	16	19,3
Education Level		
Illiterate	15	18,1
Literate	19	22,9
Primary School	26	31,3
Middle School	12	14,5
High School	7	8,4
University and Above	4	4,8
Occupation		
Housewife	49	59,0
Civil Servant	5	6,0
Freelancer	15	18,1
Retired	14	16,9
Smoking Status		
Yes	18	21,7
No	65	78,3
Alcohol Consumption		
Yes	4	4,8
No	79	95,2

Table 2. Disease-Related Characteristics

	n	%
Presence of Another Chronic Disease		
Yes	83	100
No	0	0
Other Chronic Diseases *		
Respiratory System Diseases **	12	14,4
Cardiovascular System Diseases ***	27	32,4
Kidney Failure	6	7,2
Other ****	23	27,6
Do you take your medications regularly?		
Yes	82	98,8
No	1	1,2
Do you have regular health check-ups?		
Yes	57	68,7
No	26	31,3
Frequency of Health Check-Ups		
Monthly	21	25,3
Every 3 Months	20	24,1
Every 6 Months	14	16,9
Annually	2	2,4
Irregular	26	31,3
Regular Blood Glucose Monitoring		
Yes	54	65,1
No	29	34,9
Regular Exercise		
Yes	21	25,3
No	62	74,7
Regular Foot Care		
Yes	11	13,3
No	72	86,7

*Multiple options can be specified **Asthma and COPD ***Hypertension, heart failure, arrhythmias ****Rheumatism, Alzheimer's, osteoporosis

Table 3. Distribution of Participants' Use of Complementary and Alternative Medicine (CAM) (N=83)

CAM Modalities	n	%
Spiritual/Religious Approaches		
Prayer (Individual)	76	91,6
Performing Salah (Ritual Prayer)	68	81,9
Seeking Prayer from a Religious Leader	6	7,2
Visiting Shrines	3	3,6
Carrying Amulets	2	2,4
Herbal Approaches		
Herbal Teas (Linden, sage, rosehip, etc.)	64	77,1
Spices and Seeds (Ginger, turmeric, black cumin, etc.)	42	50,6
Nettle (Urtica dioica)	21	25,3
Nutritional Approaches		
Natural Foods (Honey, vinegar, molasses, etc.)	58	69,9
Vitamin Supplements	19	22,9
Fish Oil	7	8,4
Lifestyle and Other Approaches		
Exercise (Walking, etc.)	18	21,7
Acupuncture	1	1,2
Meditation	1	1,2
Leech Therapy / Cupping	1	1,2
Reiki	0	0,0

A significant relationship was found between alcohol consumption and the DSCS total score, indicating that those who did not consume alcohol had better self-care levels ($p=0.016$). It was found that individuals who had regular health check-ups had higher DSCS total scores compared to those who did not ($p<0.001$). Similarly, those who regularly monitored their blood glucose levels and those who performed regular foot care had higher DSCS total scores compared to those who did not ($p<0.001$) (Table 4).

Table 4: Relationship Between the Total Scores of the Diabetes Self-Care Scale (DSCS), the Complementary and Alternative Medicine Approaches Scale (CAMAS), and Various Variables

Variables	DSCS Total Score		CAMAS Total Score	
	X±SD	p	X±SD	p
Gender				
Female	78,53±9,96	0,756	18,33±3,33	0,104
Male	77,79±11,11		17,13±2,80	
Marital Status				
Married	77,67±10,48	0,277	18,28±3,18	0,031
Single	80,81±9,50		16,37±2,77	
Smoking Status				
Yes	76,00±9,02	0,293	18,27±2,86	0,589
No	78,90±10,62		17,81±3,28	
Alcohol Consumption				
Yes	66,25±9,28	0,016	17,25±2,75	0,671
No	78,88±10,03		17,95±3,22	
Do you have regular health check-ups?				
Yes	81,19±9,49	p<0,001	17,54±3,07	0,116
No	71,88±9,24		18,73±3,34	
Regular Blood Glucose Monitoring				
Yes	81,83±9,37	p<0,001	18,05±3,42	0,589
No	71,65±8,69		17,65±2,75	
Regular Exercise				
Yes	81,28±10,35	0,123	19,33±3,05	0,018
No	77,25±10,18		17,43±3,11	
Regular Foot Care				
Yes	90,54±10,68	p<0,001	17,81±3,18	0,914
No	76,40±8,94		17,93±3,21	

It was found that married individuals had higher total scores on the CAMAS compared to single individuals ($p=0.031$), and those who exercised regularly had higher total scores compared to those who did not ($p=0.018$) (Table 4). Individuals who regularly monitored their blood glucose levels had higher scores in the herbal approach sub-dimension compared to those who did not ($p=0.013$). Married individuals had higher scores in the nutritional approach sub-dimension compared to single individuals ($p=0.003$), smokers had higher scores compared to non-smokers ($p=0.011$), and those who did not undergo regular health check-ups had higher scores compared to those who did ($p=0.001$). Individuals who did not regularly monitor their blood glucose levels had higher scores in the nutritional approach sub-dimension compared to those who did ($p=0.001$), and those who exercised regularly had higher scores compared to those who did not ($p=0.005$). A significant relationship was found between occupation and scores in the nutritional approach sub-dimension ($p=0.009$). Further statistical analysis revealed that retirees had higher scores compared to civil servants ($p=0.020$) (Table 5).

Statistical analysis also showed that women had higher scores in the spiritual approach sub-dimension compared to men ($p=0.007$), non-smokers had higher scores compared to smokers ($p=0.013$), and non-drinkers had higher scores compared to drinkers ($p=0.016$). Individuals who regularly monitored their blood glucose levels had higher scores in the spiritual approach sub-dimension compared to those who did not ($p=0.038$), and a significant relationship was found between occupation and scores in the spiritual approach sub-dimension ($p=0.001$). Further analysis revealed that housewives had higher scores compared to civil servants ($p=0.007$) and those engaged in freelance work ($p=0.016$). Additionally, smokers had higher scores in the cognitive approach sub-dimension compared to non-smokers ($p=0.011$), and those who exercised regularly had higher scores compared to those who did not ($p<0.001$). A significant relationship was found between occupation and scores in the cognitive approach sub-dimension ($p=0.018$). Further analysis revealed that civil servants had higher scores compared to retirees ($p=0.033$) (Table 5).

Correlation analysis revealed significant positive relationships between the DSCS total score and the duration of diagnosis, length of hospital stay, the total score of the herbal approach sub-dimension, the nutritional approach sub-dimension, and the spiritual approach sub-dimension ($p=0.006$; $p=0.026$; $p=0.008$; $p=0.040$; $p<0.001$, respectively). There were also significant positive relationships between the CAMAS total score and the total scores of the herbal approach, nutritional approach, and cognitive approach sub-dimensions ($p<0.001$; $p<0.001$; $p=0.007$, respectively). Additionally, significant positive relationships were found between the total score of the herbal approach sub-dimension and the number of cigarettes smoked, the amount of alcohol consumed, education level, and the total score of the cognitive approach sub-dimension ($p=0.003$; $p=0.032$; $p=0.002$; $p=0.003$, respectively). Conversely, significant negative relationships were identified between the total score of the herbal approach sub-dimension and age, duration of diagnosis, length of hospital stay, and the total score of the spiritual approach sub-dimension ($p=0.001$; $p<0.001$; $p=0.011$; $p=0.023$, respectively). Furthermore, a positive relationship was observed between the total score of the spiritual approach sub-dimension and age, as well as the duration of diagnosis ($p=0.003$; $p=0.018$, respectively). However, significant negative relationships were found between the total score of the spiritual approach

sub-dimension and the number of cigarettes smoked, education level, and the total score of the cognitive approach sub-dimension ($p=0.007$; $p=0.002$; $p=0.028$, respectively). For the cognitive approach sub-dimension, negative relationships were noted with age and duration of diagnosis ($p<0.001$; $p=0.004$, respectively), while positive relationships were found with the number of cigarettes smoked and education level ($p=0.016$; $p=0.007$, respectively) (Table 6).

Discussion

In this study, which aimed to determine the use of complementary and alternative medicine (CAM), self-care levels, and the factors affecting these among diabetes patients, it was found that non-drinkers had higher self-care levels compared to drinkers.

The average total score of the DSCS in this study was 78.28 ± 10.31 . In a study conducted in our country, the average score was found to be 96.25 ± 19.61 (Yumuşak, Sezer, & Dağdeviren, 2023). This study found no significant difference between gender and self-care levels. Similarly, a study by Yumuşak et al. (2023) also reported no significant relationship between gender and self-care (Yumuşak, Sezer, & Dağdeviren, 2023). However, other studies have shown that female diabetes patients have higher self-care levels compared to males (Karakurt, 2008; Erimlez, 2018; Ausili et al., 2018).

It was found that individuals who had regular health check-ups had higher self-care levels compared to those who did not. Similarly, those who regularly monitored their blood glucose levels and performed regular foot care had higher self-care levels. This underscores the critical importance of regular health check-ups and personal health monitoring in diabetes management (American Diabetes Association, 2020). Consequently, our study found that individuals who underwent regular health check-ups had better self-care levels. It is expected that individuals who perform necessary self-care activities, such as foot care and blood glucose monitoring, would have higher self-care levels.

In our study, the most frequently preferred methods were prayer (91.6%) and performing salah (81.9%). This indicates that spiritual beliefs play a central role in coping with chronic diseases in Turkish society. The literature frequently emphasizes that patients with diabetes turn to religious approaches to alleviate the psychological burden of the disease and maintain hope. Our findings confirm that religious coping methods are an indispensable support mechanism for these patients.

Among herbal approaches, the use of herbal teas (77.1%) and natural foods such as honey or vinegar (69.9%) is highly prevalent. Notably, the 25.3% rate of nettle use is significant, as there is a widespread public belief in its blood glucose lowering effects. However, since the uncontrolled use of these methods carries a risk of interaction with medical treatments, they must be carefully monitored by healthcare professionals.

The most striking finding of our study is that as the use of herbal, nutritional, and spiritual approaches increased, the self-care levels of the patients also increased. This suggests that patients who utilize CAM methods are actively attempting to gain more control over their health and are taking a more proactive role in disease management. In other words, these patients are not merely passive medication users but are 'high-self-care' individuals seeking diverse ways to improve their well-being. Studies have reported that individuals who use CAM exhibit more positive health behaviors and better diabetes self-management (Canaway & Manderson, 2013; Bell et al., 2006).

Table 5: Relationship Between the Sub-Dimensions of the Complementary and Alternative Medicine Approaches Scale (CAMAS) and Various Variables

Variables	Herbal Approach Total Score		Nutritional Approach Total Score		Spiritual Approach Total Score		Cognitive Approach Total Score	
	X±SD	p	X±SD	p	X±SD	p	X±SD	p
Gender								
Female	6,42±2,53	0,108*	9,50±1,54	0,557*	2,05±0,78	0,007*	0,35±0,55	0,733*
Male	5,51±2,23		9,72±1,85		1,5±0,63		0,31±0,47	
Marital Status								
Married	6,22±2,54	0,384*	9,83±1,59	0,003*	1,88±,09	0,791*	,34±,50	0,834*
Single	5,62±2,02		8,50±1,46		1,93±,21		,31±,60	
Smoking Status								
Yes	5,72±2,08	0,454*	10,44±1,29	0,011*	1,50±,70	0,013*	,61±,60	0,011*
No	6,21±2,55		9,33±1,66		2,00±,75		,26±,47	
Alcohol Consumption								
Yes	4,75±1,25	0,259*	11,25±1,50	0,259*	1,00±,81	0,016*	,25±,50	0,735*
No	6,17±2,48		9,49±1,61		1,93±,73		,34±,52	
Do you have regular health check-ups?								
Yes	6,05±2,50	0,761*	9,17±1,52	0,001*	2,00±,77	0,055*	,31±,50	0,582*
No	6,23±2,39		10,46±1,58		1,65±,68		,38±,57	
Regular Blood Glucose Monitoring								
Yes	6,59±2,63	0,013*	9,16±1,56	0,001*	2,01±,73	0,038*	,27±,49	0,159*
No	5,20±1,80		10,34±1,54		1,65±,76		,44±,57	
Regular Exercise								
Yes	6,19±2,78	0,861*	10,42±1,20	0,005*	1,71±,64	0,221*	1,00±,45	p<0,001*
No	6,08±2,35		9,29±1,68		1,95±,79		,11±,32	
Occupation								
Housewife	6,38±2,62	0,374**	9,42±1,52	0,009**	2,10±0,79	0,001**	0,30±0,50	0,018**
Civil Servant	5,80±0,83		11,20±1,09		1,00±0,00		0,80±0,83	
Freelancer	5,13±2,47		10,26±1,27		1,46±0,74		0,53±0,51	
Retired	6,28±2,05		8,78±2,00		1,92±0,26		0,07±0,26	

*t testi, ** Anova testi

Table 6. Correlation Between the Total Scores of the Diabetes Self-Care Scale (DSCS), the Complementary and Alternative Medicine Approaches Scale (CAMAS) and Its Sub-Dimensions, and Various Variables

	DSCS Total Score		CAMAS Total Score		Herbal Approach Total Score		Nutritional Approach Total Score		Spiritual Approach Total Score		Cognitive Approach Total Score	
	r	p	r	p	r	p	r	p	r	p	r	p
Age	0,164	0,139*	-0,177	0,109*	0,007	0,952*	-0,370	0,001*	0,326	0,003*	-0,423	p<0,001*
Number of Cigarettes Smoked	-0,156	0,159*	0,100	0,367*	-0,049	0,658*	0,321	0,003*	-,0296	0,007*	0,265	0,016*
Number of Alcoholic Drinks Consumed	-0,196	0,076*	-0,008	0,945*	-0,096	0,386*	0,236	0,032*	-0,193	0,081*	-0,056	0,616*
Duration of Diagnosis	0,301	0,006*	-0,141	0,207*	0,081	0,470*	-0,414	p<0,001*	0,261	0,018*	-0,314	0,004*
Length of Hospital Stay	0,244	0,026*	-0,188	0,089*	-0,047	0,671*	-0,278	0,011*	0,038	0,732*	-0,103	0,355*
Education Level	-0,178	0,108**	0,151	0,172**	-0,017	0,880**	0,335	0,002**	-0,335	0,002**	0,293	0,007**
DSCS Total Score	1	-	0,211	0,056*	0,291	0,008*	-0,226	0,040*	0,382	p<0,001*	0,073	0,514*
CAMAS Total Score	0,211	0,056*	1	-	0,824	p<0,001*	0,548	p<0,001*	0,146	0,188*	0,294	0,007*
Herbal Approach Total Score	0,291	0,008*	0,824	p<0,001*	1	-	0,051	0,649*	0,097	0,382*	0,028	0,801*
Nutritional Approach Total Score	-0,226	0,040*	0,548	p<0,001*	0,040	0,649*	1	-	-0,250	0,023*	0,322	0,003*
Spiritual Approach Total Score	0,382**	p<0,001*	0,146	0,188*	0,097	0,382*	-0,250	0,023*	1	-	-0,242	0,028*
Cognitive Approach Total Score	0,073	0,514*	0,294	0,007*	0,028	0,801*	0,322	0,003*	-0,242	0,028*	1	-

*Pearson Correlation, ** Spearman's Correlation

It was found that married individuals had higher levels of CAM usage and nutritional approach usage compared to single individuals. This finding suggests that social support and family interactions may play a crucial role in health management and the inclination towards alternative treatment methods (Gallant, 2003). Family support can help individuals feel more secure when making health-related decisions and allow them to explore different treatment options (Umberson & Montez, 2010).

In this study, it was observed that women had higher levels of spiritual approach usage compared to men, non-smokers had higher levels compared to smokers, and non-drinkers had higher levels compared to drinkers. Individuals who regularly monitored their blood glucose levels had higher levels of spiritual approach usage compared to those who did not. Additionally, housewives had higher levels of spiritual approach usage compared to civil servants and those engaged in freelance work. Previous studies have reported no significant relationship between gender and CAM usage (Ali-Shtayeh, Jamous, & Jamous, 2012; Ceylan et al., 2009; Chang, Wallis, & Tiralongo, 2012; Hashempur et al., 2015; Many, Champion, & Dunning, 2012; Moolasarn et al., 2005). However, one study indicated that CAM usage was significantly associated with female gender (Raja et al., 2019). Therefore, there are varied results regarding gender-related differences.

This study also revealed differences in the use of CAM among various occupational groups. Retirees had higher nutritional approach usage levels compared to civil servants. Conversely, civil servants had higher cognitive approach usage levels compared to retirees. A study reported a significant relationship between CAM usage and unemployment (Raja et al., 2019), which is consistent with our findings.

In this study, it was found that smokers had higher nutritional and cognitive approach usage levels compared to non-smokers. Individuals who did not undergo regular health check-ups had higher nutritional approach usage levels compared to those who did. Those who engaged in regular exercise had higher overall CAM usage levels, as well as higher cognitive and nutritional approach usage levels compared to those who did not exercise. Individuals who regularly monitored their blood glucose levels had higher herbal approach usage levels compared to those who did not; however, those who did not regularly monitor their glucose levels had higher nutritional approach usage levels compared to those who did. As the number of cigarettes smoked, the amount of alcohol consumed, and the level of education increased, the usage level of the herbal approach also increased. However, as age, duration of diagnosis, and length of hospital stay decreased, the usage level of the herbal approach increased. The usage level of the spiritual approach increased with age and duration of diagnosis, but decreased with higher levels of cigarette smoking and education. The cognitive approach usage level decreased with age and duration of diagnosis but increased with higher levels of cigarette smoking and education. A study found that CAM usage was significantly associated with female gender, older age, divorced/widowed marital status, lower education, unemployment, longer duration of diabetes, diabetes-related complications, and poor glycemic control (Raja et al., 2019). Three studies reported a significant relationship between the duration of diagnosis and CAM usage (Ceylan et al., 2009; Khalaf & Whitford, 2010; Naja et al., 2014). Studies conducted in Taiwan and the USA reported a significant relationship between age and CAM usage (Bell et al., 2006; Chang, Wallis, & Tiralongo, 2012). Other studies have found a significant

relationship between education level and CAM usage among diabetes patients (Bell et al., 2006; Ceylan et al., 2009; Hasan et al., 2011; Kumar, Bajaj, & Mehrotra, 2006). Longer disease duration, older age, higher education level, and higher family income were reported as factors increasing CAM usage in the USA and India (Egede et al., 2002; Kumar, Bajaj, & Mehrotra, 2006). These findings support the results of our study.

Conclusions and Recommendations

In conclusion, the findings of this study suggest that certain lifestyle factors and regular health practices are associated with self-care levels and CAM use among patients with diabetes. The importance of multidisciplinary approaches and lifestyle modifications in diabetes management is evident. Future studies with larger sample sizes and long-term follow-ups will help to support these findings and provide a better understanding of the potential benefits and limitations of CAM in diabetes management.

Limitations

This study is limited to a sample of 83 people (N=83). For the generalizability of the findings, it is recommended to conduct similar studies in larger groups covering different regions.

Relevance of Clinical Practice

Some alternative therapies used affect medication compliance in patients with diabetes mellitus. Knowing the alternative therapies used may help to reach easier results in nursing practices and to prevent possible negativities before they occur.

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Consent to Participate: Written informed consent was obtained from all participants.

Availability of Data and Materials: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Code Availability: Not applicable.

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Beden Eğitimi ve Spor Öğretmenliği Öğrencilerine Verilen Tip 1 Diyabet ile İlgili Akran Eğitiminin Etkinliği

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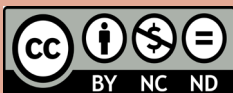
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Özet

Amaç: Bu araştırma, beden eğitimi ve spor öğretmenliği öğrencilerine verilen "Tip 1 Diyabetle İlgili Akran Eğitimi"nin etkinliğini değerlendirmek amacıyla yapıldı.

Gereç ve Yöntem: Çalışma tek grup ön-test ve son-test tasarımı olup araştırmanın örneklemini 2024-2025 eğitim-öğretim yılı bahar döneminde bir devlet üniversitesinin spor bilimleri fakültesinde öğrenim gören 3. Sınıflardan 25, 4. Sınıflardan 15 olmak üzere toplam 40 öğrenci oluşturmuştur (n=40). Araştırma verilerinin toplanmasında "Öğrenci Bilgi Formu" ve "Tip 1 Diyabet Soru Formu" kullanılmıştır. Veriler tanımlayıcı istatistikler, Friedman testi, Cochran's Q testi ve Bonferroni post-hoc testi kullanılarak analiz edildi. İstatistiksel anlamlılık düzeyi p<0,05 olarak kabul edildi.

Bulgular: Öğrencilerin "Tip 1 Diyabet Soru Formu"ndan aldıkları puanların üç ölçüm zamanı arasında istatistiksel olarak anlamlı düzeyde farklılık gösterdiği saptandı (p<0,001). Katılımcıların, akran eğitimi öncesine göre, eğitim sonrası ve eğitimden 2 hafta sonrasında "Tip 1 Diyabet Soru Formu"na verdikleri yanıtlardaki doğru oranların yüzdesi anlamlı olarak daha yüksek bulundu (p<0,05).

Sonuç: Beden eğitimi ve spor öğretmenliği bölümü öğrencilerine verilen "Tip 1 Diyabetle İlgili Akran Eğitimi"nin öğrencilerin Tip 1 diyabetle ilgili bilgilerini anlamlı olarak arttırdığı ve akran eğitim modelinin etkili bir yöntem olduğu bulundu. Meslek yaşamlarında Tip 1 diyabetli öğrencilerle karşılaşma olanağı olan tüm öğretmen adaylarına Tip 1 diyabet ve yönetimi ile ilgili eğitim oturumları düzenlenmelidir.

Anahtar Sözcükler: Tip 1 Diyabet, Akran Eğitimi; Beden Eğitimi ve Spor; Öğrenci

Abstract

The Effectiveness of Peer Education on Type 1 Diabetes Among Physical Education and Sports Teaching Students

Objective: This study aimed to evaluate the effectiveness of "Peer Education on Type 1 Diabetes" provided to physical education and sports teaching students.

Method: The study was a single-group pre-test and post-test design, and the sample consisted of 40 students (25 from the 3rd year and 15 from the 4th year) studying at the Faculty of Sports Sciences of a state university during the spring semester of the 2024-2025 academic year (n=40). A "Student Information Form" and a "Type 1 Diabetes Questionnaire" were used to collect research data. Data were analyzed using descriptive statistics, the Friedman test, Cochran's Q test, and Bonferroni post-hoc test. A p-value of <0.05 was considered statistically significant.

Results: It was found that the scores students received from the "Type 1 Diabetes Questionnaire" differed statistically significantly among the three measurement times (p<0.001). The percentage of correct answers on the "Type 1 Diabetes Questionnaire" given by participants was found to be significantly higher after peer education and two weeks after the education (p<0.05).

Conclusion: It was found that "Peer Education on Type 1 Diabetes" given to physical education and sports teaching students significantly increased their knowledge about Type 1 diabetes and that the peer education model is an effective method. Training sessions on Type 1 diabetes and its management should be organized for all prospective teachers who may encounter students with Type 1 diabetes in their professional lives.

Keywords: Type 1 Diabetes; Peer Education; Physical Education and Sports; Students

Giriş

Diabetes mellitusun (DM) çocuklarda ve ergenlerde yaygın görülen şekli tip 1 diabetes mellitus (T1DM), pankreas organındaki beta hücrelerinin tahribatı sebebiyle yetersiz insülin yapımı sonucu kan glikoz seviyelerinde artma ile gelişen kronik bir hastalıktır (Lucier ve Weinstock, 2023; Paschou vd., 2018). T1DM her kişide ve yaşta ortaya çıkabilmesine rağmen, çocuk ve ergenlerde görülme sıklığı yüksektir ve okul çağındaki çocuklarda Tip 1 diyabet görülme sıklığı her geçen yıl artmaktadır (Lawrence vd., 2022; Marks, 2021). Uluslararası Diyabet Federasyonu (IDF) 2024 yılında dünyada 1,81 milyon T1DM'li çocuk ve adölesan (0-19 yaş) olduğunu ve aynı yaş aralığında 219.000 yeni T1DM vakasının teşhis edildiğini bildirmiştir (IDF, 2025). Ayrıca, IDF tahminlerine göre 2024 yılında Türkiye'de yaklaşık 47.000 T1DM ile yaşayan çocuk ve adölesan (0-19 yaş) bulunmaktadır (IDF, 2025). Türkiye'de çocuk ve adölesanlarda Tip 1 diyabet prevalans ve insidansını saptamak için yapılan bir araştırmada; insidans 10,8/100,000; prevalans 0,75/1000 olarak saptanmıştır (Yeşilkaya vd., 2017). Türkiye'de 0-18 yaş grubundaki çocuk ve adölesanlar arasında her yıl yaklaşık yeni 2500 T1DM vakası bildirilmektedir (Yeşilkaya vd., 2017). Yaş aralığına göre yıllık yeni T1DM tanı sayıları ise şu şekildedir: 0-4 yaş arasında 364, 5-9 yaş arasında 633, 10-14 yaş arasında 1000 ve 15-18 yaş arasında 467 yeni tanı almıştır (Yeşilkaya vd., 2017).

T1DM bakımı, hem çocuklar hem de aileleri için karmaşık bir süreçtir. Bu süreçte kan şekeri takibi, insülin uygulaması, düzenli ve sağlıklı beslenme, fiziksel aktivite/egzersiz gibi birçok uygulama bulunmaktadır. Okulda diyabet bakımında, öğretmenlerin, okul idaresinin ve diğer personellerin bilgi sahibi olması oldukça önemlidir çünkü her geçen gün okullardaki diyabetli öğrenci sayısı artmaktadır (Bechara vd., 2018; Marks, 2021). Bununla birlikte, ülkemizde yatılı okullar ve özel okullar hariç çoğu devlet okulunda okul hemşiresi bulunmamaktadır (Tarı ve Kitiş, 2016). T1DM yönetiminde fiziksel aktivite ve egzersiz çok önemli bir rol oynamasına karşın, doğru şekilde planlanmamış fiziksel aktivite ve egzersizler T1DM'li çocuk ve adölesanların kan şekeri dengelerini bozabilmektedir (Adaş, 2019; Chimen vd., 2012). Okullarda, beden eğitimi ve spor dersi öğrencileri fiziksel, mental ve bilişsel yönden geliştiren ve çocuklara dayanıklılık, hız, kabiliyet kazandıran fiziksel türde enerji harcanan aktiviteler içeren bir derstir (İnan vd., 2024).

Akran eğitimi; benzer yaş, beceri ve düşünce yapısındaki gruplara ait bireylerin sistemli bir şekilde bir araya getirilerek, birbirlerine bilgi aktarması, beceri geliştirmesi veya tutum kazandırması üzerine kurulmuş yaygın kullanılan etkili bir eğitim yaklaşımıdır (Aşçı vd., 2016; Ünver ve Akbayrak, 2013). Akran eğitimi öğrencilerin birbirlerine rahatlıkla soru sormasını sağlayan bir ortam sunar ve bu süreçte; otoriteden bağımsız, stresin minimumda tutulduğu bir öğrenme atmosferi yaratılır (Ünver ve Akbayrak, 2013; Yalçın, 2010). Akranlar, birbirlerine destek olarak öğrenme süreçlerini pekiştirirler (Ünver ve Akbayrak, 2013; Yalçın, 2010). Ayrıca bu yöntem, bireylerin bakış açılarını genişleterek yeni davranışlar ve özdeşimler kazanmalarına yardımcı olur (Ünver ve Akbayrak, 2013; Yalçın, 2010). Dünyada ve ülkemizde çocuk ve adölesanlar arasında hızla artan T1DM vakaları düşünüldüğünde (IDF, 2025; Yeşilkaya vd., 2017) beden eğitimi ve spor öğretmenliği bölümü öğrencilerinin ileride meslek yaşamlarında karşılaşabilecekleri Tip 1 diyabetli öğrenciler ve Tip 1 diyabet ile ilgili bilgi sahibi olmaları önemlidir. Literatür incelendiğinde ülkemizde öğretmenlere yönelik yapılan Tip 1 diyabet ile ilgili eğitim müdahalelerinin olduğu görülmüştür (Çetintaş ve Kostak, 2025; Doğan, 2016) Ancak, literatürde öğretmen adaylarına/beden eğitimi ve spor

öğretmenliği öğrencilerine Tip 1 diyabetle ilgili yapılan herhangi bir eğitim müdahalesi içeren araştırmaya rastlanmamıştır. Bu çalışma kapsamında, ülkemizde ilk kez beden eğitimi ve spor öğretmenliği öğrencilerine Tip 1 diyabetle ilgili bir eğitim girişiminin uygulanacak olması; bu eğitim girişiminde akran eğitimi yönteminin, vaka tartışmaları ve Kahoot! uygulamasında yapılacak soru-cevap etkinlikleri gibi interaktif yöntemlerin kullanılacak olması bu çalışmanın özgün değerini oluşturmaktadır.

Amaç: Bu araştırma, beden eğitimi ve spor öğretmenliği öğrencilerine verilen "Tip 1 Diyabetle İlgili Akran Eğitimi"nin etkinliğini değerlendirmek amacıyla yapıldı. Bu amaç doğrultusunda çalışmanın hipotezleri aşağıda verilmiştir:

H0 Hipotezi: Beden eğitimi ve spor öğretmenliği öğrencilerinin "Tip 1 Diyabetle İlgili Akran Eğitimi" sonrası "Tip 1 Diyabet Soru Formu"na verdikleri yanıtlardaki doğru oranların yüzdesi (son-test) ile eğitim öncesi doğru yanıt oranlarının yüzdesi (ön-test) arasında anlamlı fark yoktur.

H1 Hipotezi: Beden eğitimi ve spor öğretmenliği öğrencilerinin "Tip 1 Diyabetle İlgili Akran Eğitimi" sonrası "Tip 1 Diyabet Soru Formu"na verdikleri yanıtlardaki doğru oranların yüzdesi (son-test), eğitim öncesi doğru yanıt oranlarının yüzdesine (ön-test) göre anlamlı olarak daha yüksektir.

Gereç ve Yöntem

Araştırmanın Tipi

Bu araştırma, tek gruplu ön test-son test yarı deneysel tasarımda yürütüldü.

Araştırmanın Evreni ve Örneklemi

Bu araştırma 2024-2025 eğitim-öğretim yılı bahar döneminde Türkiye'de bir devlet üniversitesinin spor bilimleri fakültesinde akıllı tahta ve internet bağlantısının olduğu, eğitim oturumlarının yapıldığı tarihlerde uygun olan dersliklerde beden eğitimi ve spor öğretmenliği bölümü 3. ve 4. sınıf öğrencileri ile yüz yüze gerçekleştirildi.

Araştırmanın yürütüldüğü spor bilimleri fakültesinin beden eğitimi ve spor öğretmenliği bölümünde (fakülte öğrenci işlerinden alınan bilgiye göre) 3.sınıfta kayıtlı 51, 4.sınıfta kayıtlı 54 öğrenci bulunmaktadır. Daha önce benzer bir çalışma yapılmadığından katılımcıların doğru yanıtları üzerinden örneklem hesabı yapılamamıştır. Çalışmaya dahil olma kriterlerini karşılayan, gönüllü olan ve eğitim oturumlarının yapıldığı günlerde bölümdeki derslerine devam eden öğrenciler çalışmaya dahil edildi. Eğitim oturumlarına 3.sınıflardan 31 öğrenci katıldı ancak ikinci ve/veya üçüncü ölçümlerde "Tip 1 Diyabet Soru Formu"nu cevaplamadıkları için 6 öğrenci çalışma dışı bırakıldı. Eğitim oturumlarına 4.sınıflardan 20 öğrenci katıldı ancak ikinci ve/veya üçüncü ölçümlerde "Tip 1 Diyabet Soru Formu"nu cevaplamadıkları için 5 öğrenci çalışma dışı bırakıldı. İkinci ve/veya üçüncü ölçümlerde veri toplama araçlarını doldurmayan ya da eksik dolduran toplam 11 öğrenci çalışmadan çıkarılmıştır. Eğitim oturumlarına toplam 51 (31+20) öğrenci katılmasına rağmen araştırmaya 40 (25+15) öğrenci dahil edildi. Sonuç olarak araştırmanın çalışma grubunu 40 öğrenci oluşturdu (n=40). Bu çalışma için post-hoc güç analizi G*Power (version 3.1.9.7) programı kullanılarak yapıldı. Analizde $\alpha=0.05$, örneklem büyüklüğü n=40, üç tekrarlı ölçüm ve etki büyüklüğü (f=1.18) esas alındı. Yapılan analiz sonucunda çalışmanın istatistiksel gücü 1.00 (%100) olarak hesaplandı.

Busonuç, araştırmacının mevcut örneklem büyüklüğü ile istatistiksel olarak yeterligücesahip olduğunugöstermektedir. Araştırma-ya dahil etme ve araştırmadan dışlama kriterleri aşağıda verildi.

Dahil etme kriterleri:

- Araştırmaya katılmaya gönüllü olma
- Beden eğitimi ve spor öğretmenliği bölümü 3. veya 4. sınıf öğrencisi olmak
- "Tip 1 Diyabetle İlgili Akran Eğitimi" oturumlarına eksiksiz katılmak
- Ön-test ve son-test formlarını eksiksiz doldurmak
- Daha önce diyabetle ilgili herhangi bir eğitim almamış olmak

Dışlama kriterleri:

- Araştırmaya katılmaya gönüllü olmama
- Beden eğitimi ve spor öğretmenliği bölümü 1. veya 2. sınıf öğrencisi olma
- "Tip 1 Diyabetle İlgili Akran Eğitimi" oturumlarından en az birine katılmama
- Ön-test ve/veya son-test formlarını tam olarak yanıtlamama
- Daha önce diyabetle ilgili herhangi bir eğitim almış olma

Veri Toplama Araçları

"Öğrenci Bilgi Formu": Form araştırmacılar tarafından literatür doğrultusunda (Çetintaş ve Kostak, 2025; Doğan, 2016; Gökçe vd., 2022; Kobayashi vd., 2023) hazırlandı. Formda; öğrencilerin cinsiyet, yaş, sınıf, gano puanı, maddi durum, çoğunlukla yaşanan bölge, çevrelerinde diyabet tanısı almış birey/ bireyler varlığı ve Tip 1 diyabetle ilgili bilgileri hakkında toplam 8 soru bulunmaktadır.

"Tip 1 Diyabet Soru Formu": Form oluşturma sürecinde kapsamlı literatür (Adaş, 2019; Aybattı, 2020; Assarrar vd., 2025; Birol vd., 2020; Bratina vd., 2018; Çetintaş ve Kostak, 2025; Çelebi, 2014; Doğan, 2016; Kobayashi vd., 2023; Yiğit vd., 2018) taraması yapıldı. Benzer araştırmalar ve geçerlik-güvenirliliği öğretmenler üzerinde kanıtlanmış ölçek maddeleri referans alınarak soru havuzu oluşturuldu, daha sonra soru havuzundan çalışmanın amacı ve hedef grubuna uygunluk doğrultusunda 16 soru seçildi. Formda; diyabetin tanımı, tipleri, belirtileri, diyabet yönetimi, fiziksel aktivite/egzersiz ve beden eğitimi derslerine katılım ile ilgili toplam 16 doğru/yanlış/bilmiyorum seçeneği soru bulunmaktadır. Hazırlanan formda 4 adet ters soru (doğru yanıtı "yanlış" olan) bulunmakta (4,11,13 ve 15. sorular), diğer 12 soru "doğru" ifadelerden oluşmaktadır. "Tip 1 Diyabet Soru Formu" nun Kuder-Richardson 20 iç tutarlılık katsayısı 0,63 olarak hesaplandı. Formda her bir soru için doğru yanıtlara 1 puan, yanlış ya da bilmiyorum yanıtlarına 0 puan verilerek total bilgi puanı hesaplandı. Formdan alınan total puan arttıkça, katılımcıların "Tip 1 diyabet ve yönetimi" ile ilgili bilgilerinin de artacağı şeklinde değerlendirme yapıldı. Ayrıca, formdaki her bir soruya verilen cevaplar doğru/ yanlış oranları verilerek sayı ve yüzde olarak değerlendirildi.

"Tip 1 Diyabetle İlgili Akran Eğitimi" nin Uygulanması

"Tip 1 Diyabetle İlgili Akran Eğitimi" aynı günde iki oturumda yapıldı. Eğitimin etkinliğini arttırmak amacı ile eğitim 3. ve 4. sınıf öğrencilerine farklı eğitim gün ve oturumlarında yapıldı. Eğitimin ilk oturumunda ön-test uygulaması kapsamında "Öğrenci Bilgi Formu" ve "Tip 1 Diyabet Soru Formu" öğrencilere uygulandı. Ön-test/son-test formların eşleştirilmeleri için öğrencilere

formların başına bir rumuz yazmaları istendi ve sonrasında bu rumuz kullanılarak formların eşleştirmeleri yapıldı. Öğrencilere, araştırma sürecinde herhangi bir kimlik bilgisi istenmeyeceğini, araştırmadan elde edilen bilgilerin sadece bilimsel amaçla kullanılacağı bilgisi verildi. Ön-test uygulaması sonrası akran eğitici, aynı zamanda araştırmacı, tarafından "Tip 1 Diyabetle İlgili Akran Eğitimi" başlıklı sunum yapıldı. Eğitim sunumu araştırmacının yürütüldüğü fakültede uygun teknolojik ekipmanın (akıllı tahta ve internet bağlantısının olduğu) sağlandığı bir derslikte yapıldı. Eğitim sunumu araştırmacılar tarafından literatür doğrultusunda hazırlandı (Aycan vd., 2012; Birol vd., 2020; Çelik, 2019; Doğan, 2016; Hatun vd., 2020; Kin, 2021; Samancıoğlu, 2016; Silistre ve Hatipoğlu, 2019).

Eğitim sunumu diyabetin tanımı, diyabet tipleri, diyabetin oluşum mekanizması, diyabet tanısı, diyabetin belirti ve bulguları, diyabetin yönetimi, diyabet ve fiziksel aktivite, beden eğitimi dersleri, okulda diyabet ile ilgili acil durumlar konularından oluştu ve yaklaşık 40 dakika sürede Microsoft PowerPoint formatı ile sunuldu. Akran eğitici aynı üniversitede hemşirelik bölümü dördüncü sınıf öğrencisi olup Çocuk Sağlığı ve Hastalıkları Hemşireliği dersi ile Endokrin ve Metabolizma Hemşireliği derslerini alıp başarılı olmuştur. Derslerin teorik ve uygulamalarında diyabet, çocuklarda Tip 1 diyabet ve yönetimi ile ilgili bilgi ve beceri kazanmıştır. Ayrıca, bu çalışma sürecinde tüm eğitim materyallerinin hazırlanması ve akran eğitiminin uygulanması öğretim elemanı, aynı zamanda araştırmacı, danışmanlığında ve gözetiminde yürütülmüştür. Danışman öğretim elemanı ve araştırmacı yükseköğretim kurumunda çocuklarda diyabet ile ilgili ders vermekte olup, konu ile ilgili ulusal ve uluslararası yayınları mevcuttur. Sunum bitiminde öğrencilere bilgilerin kalıcı olması amacıyla diyabet ile ilgili broşürler dağıtıldı. Broşür içeriği de literatür doğrultusunda araştırmacılar tarafından eğitim sunum içeriği ile paralel olarak hazırlandı (Aycan vd., 2012; Birol vd., 2020; Çelik, 2019; Doğan, 2016; Hatun vd., 2020; Kin, 2021; Samancıoğlu, 2016; Silistre ve Hatipoğlu, 2019).

Eğitimin ikinci oturumunda spor bilimleri fakültesinde Kahoot! uygulamasının açılacağı uygun bir sınıfa geçildi. Akıllı tahta veya projeksiyon ile Kahoot! uygulaması açıldı (Kahoot!, 2024). Kahoot!, öğretmen, öğrenciler ve daha birçok kişi tarafından çoktan seçmeli, eşleştirme, doğru/yanlış, kısa cevaplı, yap-boz gibi farklı soru çeşitleri olan ve soru sormaya olanak tanıyan bir platformdur. Kişiler tarafından oluşturulan testlere bireysel olarak katılma olanağı sunar. Bu platformda oluşturulan testler akıllı tahta gibi ana ekranlarda açılarak veya yansıtılarak kullanıcılar vasıtası ve pin kodu ile akıllı telefonlardan giriş yapılır. Sorular ve cevaplar tahtada gözükür. Uygun şıkki veya cevabı katılımcılar giriş yaptıkları akıllı telefon vasıtası ile işaretler. Test sonunda sorunun cevabı gözükür, en hızlı ve doğru işaretleme yapanlar ilk sırada olacak şekilde sıralanırlar.

Eğitimin ikinci oturumu kapsamında öğrencilerin motivasyonlarını ve katılım sayılarını (uygulama ile öğrenciler anonim olarak katılabilirler) arttırmak ve interaktif bir yöntemle vaka tartışmalarını yürütmek amacı ile vaka tartışmaları Kahoot! uygulaması üzerinde yapıldı. Öğrencilere iki örnek vaka Kahoot! uygulaması vasıtası ile tahtada yansıtıldı. İki vaka tartışması için Kahoot! uygulaması üzerinden 2 yöntem kullanıldı. Yöntemlerden ilki "Beyin Fırtınası" yöntemidir. Bu yöntemde öğrencilere vaka Kahoot! uygulaması ile ekrana yansıtıldı, öğrenciler 4 dakika içinde "Okulda Beden Eğitimi Dersine Katılım" adlı vakayı okuyarak vakaya uygun çözüm yöntemlerini telefon vasıtası ile yazdılar. Tüm cevaplar toplandı ve benzer cevaplar gruplandırılarak çözüm yöntemleri oylanması için tekrar öğrencilere gönderildi. Öğrenciler tekrar cevapları oyladı ve en yüksek

orandaki cevaplar tahtaya yansıtıldı. Akran eğitimci cevapları sınıfla birlikte tartıştı. İkinci yöntem olan "Kelime Bulutu" yönteminde ise öğrencilere vaka akıllı tahta vasıtası ile yansıtıldı, öğrenciler "Okulda Hipoglisemi Gelişen Tip 1 Diyabetli Öğrencinin Yönetimi" adlı vakayı okuyup 4 dakika içinde vakaya uygun kelimeler yazdı. Yazılan kelimelere ve yoğunluklarına göre kelime bulutu oluştu. Akran eğitimci öğrencilerle birlikte kelime bulutunu tartıştı. Vaka tartışması sürecinde "Bu durum ile karşılaştığınızda ne düşünürsünüz?", "Bu durum ile karşılaştığınızda ne yaparsınız?" gibi sorular yöneltildi. Her bir vaka tartışması yaklaşık 15 dk sürdü. Vaka çalışması sonrası Kahoot! uygulaması üzerinden bilgilerin pekiştirilmesi amacı ile kısa sınav (Quiz) uygulamasına geçildi. Kahoot! uygulaması kullanılarak katılımcılara çoktan seçmeli 10 soru yöneltildi ve sorular diyabetin tipleri, belirtileri, komplikasyonları, diyabet yönetimi, fiziksel aktivite/egzersiz ve beslenme ile ilgiliydi. Sorular literatür taraması sonucunda araştırmacılar tarafından hazırlandı (Adaş, 2019; Aybattı, 2020; Bratina vd., 2018; Birol vd., 2020; Doğan, 2016). Öğrenciler kendi akıllı cihazları ile aynı anda giriş sağladılar ve Quiz sorularını cevapladılar. Kahoot! uygulamasında Quiz uygulaması yaklaşık 15 dk sürdü. Eğitim öncesi Quiz uygulamasında ilk 3'e giren öğrencilere ödül verileceği bilgisi verilerek öğrencilerin motivasyonunu arttırarak dersi aktif bir şekilde dinlemeleri sağlandı. Quiz bittikten sonra Kahoot! uygulamasının cevaplama süresi ve doğru oran yüzdesine göre oluşturduğu sıralamada ilk üçe giren öğrencilere ödülleri verildi. Kahoot! uygulamaları sonrasında tüm öğrencilere son-test uygulaması kapsamında "Tip 1 Diyabet Soru Formu" ikinci kez uygulandı. Bilgilerin kalıcılığını test etmek amacı ile eğitim oturumlarının bitiminden 2 hafta sonra "Tip 1 Diyabet Soru Formu" üçüncü kez uygulandı. 3 ölçüm formları öğrencilerin yazdığı rumuzlar ile eşleştirildi. "Tip 1 Diyabetle İlgili Akran Eğitimi" ve verilerin toplanması içeriği Tablo 1'de gösterilmiştir (Tablo 1).

Tablo 1. "Tip 1 Diyabet ile İlgili Akran Eğitimi" ve Verilerin Toplanması

OTURUM	UYGULAMA	MATERYAL	SÜRE
1.Oturum	Ön-Test Uygulaması	Veri Toplama Araçları "Öğrenci Bilgi Formu" "Tip 1 Diyabet Soru Formu"	15 dk
1.Oturum	"Tip 1 Diyabetle İlgili Akran Eğitimi"	Microsoft PowerPoint sunumu	40 dk
1. Oturum	Broşürlerin dağıtılması	Broşürler (baskı olarak)	5 dk
2.Oturum	Vaka Çalışması	Kahoot! uygulaması ile "Beyin Fırtınası" ve "Kelime Bulutu" yöntemlerini kullanarak, **Okulda Beden Eğitimi Dersine Katılım", **Okulda Hipoglisemi Gelişen Tip 1 Diyabetli Öğrencinin Yönetimi" adlı vaka tartışmaları	30 dk
2.Oturum	Kahoot! Testi	Kahoot! uygulaması ile Quiz ve ödül takdimi	15 dk
2.Oturum	Son-Test Uygulaması	Veri Toplama Araçları "Tip 1 Diyabet Soru Formu"	15 dk

Verilerin Analizi

Veriler, IBM SPSS paket programı (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.) kullanılarak analiz edildi. Katılımcıların sosyodemografik özelliklerinin değerlendirilmesinde sayı, yüzde dağılımları, ortalama ve standart sapma kullanıldı. Verilerin normal dağılıma uygunluğu Shapiro-Wilk testi ile değerlendirildi ve veri setinin normal dağılıma uygun olmadığı tespit edildi ($p < 0,05$). Öğrencilerin, eğitim öncesi, sonrası ve iki hafta sonraki ölçümlerde "Tip 1 Diyabet Soru Formu"ndan elde edilen total puanların ölçüm

zamanlarına göre karşılaştırılması, verilerin dağılım özelliklerine uygun olarak Friedman testi ile yapıldı. Katılımcıların "Tip 1 Diyabet Soru Formu"na verdikleri yanıtlardaki doğru oranların yüzdeleri Cochran's Q testi ile analiz edildi. "Tip 1 Diyabet Soru Formu" total puanlar ve öğrencilerin sorulara verdikleri doğru yanıt oranları için 3 ölçüm arasında fark tespit edilmesi durumunda farkın hangi ölçümler arasında olduğu bonferroni post-hoc testi ile belirlendi. $p < 0,05$ istatistiksel anlamlılık sınırı olarak kabul edildi.

Araştırmanın Etik Boyutu

Araştırmaya başlamadan önce, Trakya Üniversitesi Tıp Fakültesi Dekanlığı Girişimsel Olmayan Bilimsel Araştırmalar Etik Kurulundan 27/12/2024 tarih ve TUTF-GOBAEK 2024/538 protokol numarası ile etik kurul izni alındı. Çalışmanın yürütüldüğü Spor Bilimleri Fakültesi Dekanlığından 07/02/2025 tarih ve E-86053933-044-792641 sayılı kurum izni alındı. Gönüllü katılımcılara araştırmanın amacı, verilerin gizli tutularak saklanacağı, verilerin yalnızca bilimsel amaçlı kullanılacağı konusunda açıklama yapılarak, katılımcılardan sözlü ve yazılı onam alındı. Öğrencilerden veri toplama araçlarına bir rumuz yazmaları istendi. Rumuzlar aracılığı ile 3 ölçüm formlarının eşleştirmeleri yapıldı.

Araştırmanın Sınırlılıkları

Bu çalışmanın bazı sınırlılıkları bulunmaktadır. Araştırmanın kontrol grubu olmadan tek grup üzerinden yürütülmesi, gözlenen değişimlerin yalnızca uygulanan müdahaleden kaynaklandığının kesin olarak gösterilmesini sınırlandırmaktadır. Ayrıca verilerin tek merkezden elde edilmesi bulguların genellenebilirliğini kısıtlayabilir. Bu çalışmanın diğer sınırlılıklarından biride, literatürde öğretmen adaylarının Tip 1 diyabetle ilgili bilgi düzeyini değerlendiren geçerli ve güvenilir test/ölçme aracı bulunmadığından, bu çalışmada literatür doğrultusunda oluşturulan "Tip 1 Diyabet Soru Formu"nun kullanılması ve form için uzman görüşü alınamamasıdır. Son olarak bu çalışmada, katılımcıların "Tip 1 Diyabet Soru Formu"na verdikleri cevaplar kendi bildirimleri ile sınırlıdır.

Bulgular

Çalışmaya katılan öğrencilerin yaş ortalaması $21,95 \pm 1,43$ yıl, %62,5'inin erkek, %62,5'inin üçüncü sınıf öğrencisi olduğu, genel ağırlıklı not ortalamalarının ortalamasının $3,18 \pm 0,29$ olduğu bulundu. Öğrencilerin %67,5'inin gelirin giderine eşit olduğu, %75'i yaşamının çoğunu il merkezinde geçirdiği, %55'inin çevresinde (aile, akraba, arkadaş vb.) diyabet tanılı bireyin olmadığı, %77,5'inin Tip 1 diyabetle ilgili bilgi sahibi olmadığı belirlendi (Tablo 2).

Öğrencilerin "Tip 1 Diyabet Soru Formu"ndan aldıkları puanların üç ölçüm zamanı arasında istatistiksel olarak anlamlı düzeyde farklılık gösterdiği saptandı ($p < 0,001$). Post-hoc çoklu karşılaştırma analizleri sonucunda, eğitim sonrası ve eğitimden iki hafta sonraki ölçüm puanlarının eğitim öncesi puanlara göre anlamlı düzeyde daha yüksek olduğu belirlendi ($p < 0,001$). Bulgular, öğrencilerin "Tip 1 diyabet ve yönetimi" ile ilgili total bilgi puanlarının eğitim sonrasında arttığını ve bu artışın eğitimden iki hafta sonra da sürdürüldüğünü göstermektedir (Tablo 3).

Öğrencilerin "Tip 1 Diyabetle İlgili Akran Eğitimi" öncesi, sonrası ve eğitimden iki hafta sonraki "Tip 1 Diyabet Soru Formu"na verdikleri yanıtlardaki doğru/yanlış oranları karşılaştırıldığında; "Tip 1 Diyabet Soru Formu"nun 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 14. ve 16. sorularda üç ölçüm arasında katılımcıların doğru/yanlış oranları arasında istatistiksel olarak anlamlı fark vardı ($p < 0,05$, Tablo 4).

Tablo 2. Öğrencilerin Tanımlayıcı Özelliklerinin Dağılımı (n=40)

Değişkenler	*Ort±SS/n(%)	
Yaşı (yıl)	21,95±1,43 (Min:20; Max: 27)	
Cinsiyet		
Kadın	15	37,5
Erkek	25	62,5
Sınıf		
3.Sınıf	25	62,5
4.Sınıf	15	37,5
Genel ağırlıklı not ortalaması	3,18±0,29 (Min:2,50; Max: 3,79)	
Maddi durum		
Gelir giderden az	9	22,5
Gelir gidere eşit	27	67,5
Gelir giderden fazla	4	10,0
Çoğunlukla yaşadığı yer		
İl	30	75,0
İlçe	9	22,5
Kasaba	1	2,5
Çevrede diyabet tanılı birey/bireylerin bulunma durumu		
Var	18	45,0
Yok	22	55,0
Tip 1 diyabetle ilgili bilgi sahibi olma durumu		
Evet	9	22,5
Hayır	31	77,5

*Ort±SS/n(%); Ortalama±Standart Sapma/Sayı(yüzde)

Tablo 3. Öğrencilerin "Tip 1 Diyabet Soru Formu" Puanlarının Eğitim Öncesi, Eğitim Sonrası ve Eğitimden İki Hafta Sonraki Ölçümlerde Karşılaştırılması (n=40)

Ölçümler	X±SS	Sıra Ort.	Ortanca	Test
Eğitim öncesi¹	9,40±2,91	1,16	9,50	Chi-Square: 46,71 sd:2 p<0,001
Eğitim sonrası²	13,40±2,03	2,48	14,00	
Eğitimden iki hafta sonra³	13,15±1,84	2,36	13,00	
Çoklu karşılaştırmalar	1-2	1-3	2-3	
Z	2>1	3>1	-	
p	-5,246 p<0,001	-5,094 p<0,001	-0,672 p=0.501	

X±SS: Ortalama±Standart sapma, Sıra Ort.: Sıra ortalaması, Test: Friedman testi, Z: Bonferroni düzeltilmiş Wilcoxon işaretli sıralama testi, sd: serbestlik derecesi.

Öğrencilerin "Tip 1 Diyabetle İlgili Akran Eğitimi" öncesi, sonrası ve eğitimden iki hafta sonraki "Tip 1 Diyabet Soru Formu"ndaki 6, 12, 13 ve 15. sorularda üç ölçüm arasında doğru/yanlış oranları arasında istatistiksel olarak anlamlı fark saptanmadı (p>0,05, Tablo 4).

Yapılan post-hoc çoklu karşılaştırma testlerinde ise "Tip 1 Diyabet Soru Formu"nun 1. ve 8. sorularında katılımcıların eğitim öncesi ve eğitimden iki hafta sonraki doğru/yanlış oranları arasında istatistiksel olarak anlamlı fark bulundu (p<0,05). Katılımcıların 1. ve 8. sorularına verdikleri yanıtlarda eğitimden iki hafta sonraki doğru cevap oranları, eğitim öncesine göre anlamlı olarak yüksekti (Tablo 4). "Tip 1 Diyabet Soru Formu"nun 2, 3, 4, 5, 7, 8, 9, 10, 11, 14, ve 16. sorularında katılımcıların eğitim öncesi ve eğitim sonrası doğru/yanlış oranları arasında istatistiksel olarak anlamlı fark vardı (p<0,05). Bu sorular için katılımcıların verdikleri yanıtlarda eğitim sonrası doğru cevap oranları, eğitim öncesi doğru cevap oranlarına göre anlamlı olarak daha yüksek bulundu (Tablo 4). "Tip 1 Diyabet Soru Formu"nun 2, 3, 4, 5, 7, 8, 9, 10, 11, 14, ve 16. sorularında katılımcıların eğitim öncesi ve eğitimden iki hafta

sonrasındaki doğru/yanlış oranları arasında istatistiksel olarak anlamlı fark vardı (p<0,05). Bu sorularda, öğrencilerin eğitimden iki hafta sonraki doğru cevap oranları, eğitim öncesi doğru cevap oranlarına göre anlamlı olarak daha yüksekti (Tablo 4).

Öğrencilere Kahoot uygulaması üzerinden yapılan Quizde 3.sınıf öğrencilerin total doğru oranı %56,90, 4.sınıf öğrencilerinin total doğru oranı %65,00 bulundu. Öğrencilerin Quiz sorularına verdikleri yanıtların doğru oranlarının yüzdesi Tablo 5'de sunuldu.

Okulda beden eğitimi ve spor dersinde hipoglisemi yaşayan bilinci açık Tip 1 diyabetli bir çocukla ilgili örnek vakada (Kelime Bulutu) katılımcıların çoğunluğunun durumun "hipoglisemi" olduğunu fark ederek kesme şeker, meyve suyu gibi hızlı etki eden basit karbonhidrat almasını sağlarını anlamında yanıt verdikleri görülmüştür.

Okulda beden eğitimi ve spor dersi kapsamında futbol oynamak isteyen Tip 1 diyabetli bir çocukla ilgili örnek vakada (Beyin Fırtınası) katılımcıların çoğunluğu Tip 1 diyabetli bir çocuğun futbol dahil tüm fiziksel aktivite/egzersizleri yapabileceği ancak kan şekeri kontrolü ve gerektiğinde ek karbonhidrat alması gibi önlemlere vurgu yaptıkları görülmüştür.

Tablo 5. Öğrencilerin Eğitim Sonrası Quiz Sorularına Verdikleri Yanıtların Doğru Oranlarının Dağılımı

SORU	3.sınıf öğrencilerin doğru oranları	4.sınıf öğrencilerin doğru oranları
1.Pankreastaki hücrelerin yıkımı sonucu vücudun insülin üretememesi ile oluşan diyabet tipi hangisidir?	%82,76	%85,00
2.Kan şekeri seviyesinin 70 mg/dl nin altına düşmesine ne denir?	%68,97	%70,00
3.Tip 1 diyabet yönetiminde kullanılan ve kan şekeri seviyesini yükselten hormonun adı nedir?	%37,93	%15,00
4.Tip 1 diyabette dışarıdan insülin alınmadığı zaman vücut enerji sağlamak için neyi kullanır?	%17,24	%40,00
5.Kan şekeri düşüklüğü durumunda ilk alınması gereken besin hangisidir?	%65,52	%85,00
6.Kan şekeri seviyesinin 180 mg/dl nin üstüne çıkmasına ne denir?	%58,62	%70,00
7.Hangi besinin glisemik indeksi daha yüksektir?	%79,31	%65,00
8.Tip 1 diyabet yönetiminde kullanılan ve kan şekeri seviyesini düşüren hormonun adı nedir?	%62,07	%90,00
9.Hangisi kan şekeri düşüklüğü belirtilerinden değildir?	%10,34	%45,00
10.Tip 1 diyabet yönetiminde aşağıdaki bileşenlerden hangisi yoktur?	%86,21	%85,00
TOTAL DOĞRU ORANI	%56,90	%65,00

Tartışma

Tip 1 diyabet her yaşta görülebilmekle birlikte çocukluk ve ergenlik dönemlerinde daha yaygındır ve okul çağındaki çocuklarda görülme sıklığı artmaktadır (Lawrence vd., 2022; Marks, 2021).

Tablo 4. Öğrencilerin "Tip 1 Diyabet Soru Formu"na Verdikleri Yanıtlardaki Doğru/Yanlış Oranların Eğitim Öncesi, Eğitim Sonrası ve Eğitimden İki Hafta Sonraki Ölçümlerde Karşılaştırılması (n=40)

İfadeler	Eğitim öncesi ¹				Eğitim sonrası ²				Eğitimden iki hafta sonra ³				Test	
	Doğru		Yanlış		Doğru		Yanlış		Doğru		Yanlış			
	n	%	n	%	n	%	n	%	n	%	n	%		
Soru-1	30	75	10	25	37	92,5	3	7,5	39	97,5	1	2,5	*10,308 sd:2 p=0,006	3>1 (3,057) ***p=0,007
Soru-2	28	70	12	30	37	92,5	3	7,5	38	95	2	5	*13,000 sd:2 p=0,002	2>1 (2,946) ***p=0,010 3>1 (-3,273) ***p=0,003
Soru-3	27	67,5	13	32,5	38	95	2	5	38	95	2	5	*18,615 sd=2 p<0,001	2>1 (3,737) **p=0,001 3>1 (-3,737) **p=0,001
Soru-4	8	20	32	80	26	65	14	35	19	47,5	21	57,5	*20,583 sd=2 p<0,001	2>1(4,500) ***p<0,001 3>1 (2,750) ***p=0,018
Soru-5	22	55	18	45	38	95	2	5	34	85	6	15	*21,895 sd=2 p<0,001	2>1 (4,496) ***p<0,001 3>1 (-3,372) ***p=0,002
Soru-6	34	85	6	15	38	95	2	5	37	92,5	3	7,5	*2,889 sd=2 p=0,236	-
Soru-7	30	75	10	25	37	92,5	3	7,5	37	92,5	3	7,5	*8,909 sd=2 p=0,012	2>1 (2,585) **p=0,029 3>1 (-2,585) **p=0,029
Soru-8	22	55	18	45	25	62,5	15	37,5	32	80	8	20	*6,583 sd=2 p=0,037	3>1 (-2,500) **p=0,037
Soru-9	17	42,5	23	57,5	31	77,5	9	22,5	33	82,5	7	17,5	*16,889 sd:2 p<0,001	2>1 (3,300) ***p=0,003 3>1 (3,771) ***p<0,001
Soru-10	27	67,5	13	32,5	37	92,5	3	7,5	37	92,5	3	7,5	*13,333 sd:2 p=0,001	2>1 (3,162) ***p=0,005 3>1 (3,162) ***p=0,005
Soru-11	17	42,5	23	57,5	31	77,5	9	22,5	28	70	12	30	*13,040 sd:2 p=0,001	2>1 (3,429) ***p=0,002 3>1 (2,694) ***p=0,021
Soru-12	29	72,5	11	27,5	36	90	4	10	34	85	6	15	*4,875 sd:2 p=0,087	-
Soru-13	34	85	6	15	37	92,5	3	7,5	33	82,5	7	17,5	*2,364 sd:2 p=0,307	-
Soru-14	17	42,5	23	57,5	33	82,5	7	17,5	34	85	6	15	*21,000 sd:2 p<0,001	2>1 (3,843) ***p<0,001 3>1 (4,083) ***p<0,001
Soru-15	22	55	18	45	28	70	12	30	25	62,5	15	37,5	*2,700 sd:2 p=0,259	-
Soru-16	12	30	28	70	27	67,5	13	32,5	28	70	12	30	*20,083 sd:2 p<0,001	2>1 (3,750) ***p=0,001 3>1 (4,000) ***p<0,001

*Cochran's Q testi; sd=serbestlik derecesi; **Bonferroni post-hoc testi; p<0,05 istatistiksel anlamlılık sınırı.

Öğretmenler başta olmak üzere okul personelinin diyabet konusunda yeterli bilgi ve beceriye sahip olması, Tip 1 diyabetli öğrencilerin okul yaşamında desteklenmesi açısından önemlidir (Bechara vd., 2018; Lawrence vd., 2022). Literatürde, okulda diyabet yönetiminin iyileştirilmesi amacıyla öğretmenlerin Tip 1 diyabetle ilgili bilgi düzeyi ve farkındalıklarının artırılmasının önemli bir unsur olduğu belirtilmektedir (Gökçe vd., 2021; Marks vd., 2013). Literatürde öğretmen adaylarına/beden eğitimi ve spor öğretmenliği öğrencilerine Tip 1 diyabetle ilgili yapılan herhangi bir eğitim müdahalesi içeren araştırmaya rastlanmamıştır. Bu çalışma kapsamında, ülkemizde ilk kez beden eğitimi ve spor öğretmenliği öğrencilerine Tip 1 diyabetle ilgili bir eğitim girişiminin uygulanmış olması; bu eğitim girişiminde akran eğitimi yönteminin, vaka tartışmaları ve Kahoot! uygulamasında yapılan soru-cevap etkinlikleri gibi interaktif yöntemlerin kullanılması bu çalışmanın özgün değerini oluşturmaktadır. Bu bağlamda bu çalışma, beden eğitimi ve spor öğretmenliği öğrencilerine verilen "Tip 1 Diyabetle İlgili Akran Eğitimi"nin etkinliğinin belirlenmesi amacı ile yapıldı.

Bu araştırmaya katılan beden eğitimi ve spor öğretmenliği bölümü öğrencilerinin %77,5'inin daha önce Tip 1 diyabet hakkında bilgi/eğitim almadığı bulundu (Tablo 2). Benzer şekilde literatürde öğretilenler veya öğretmen adayları ile yapılan araştırmalarda (Assarrar vd., 2025; Dixe vd., 2020), katılımcıların Tip 1 diyabete yönelik bilgi, tutum ve farkındalıklarının kısıtlı olduğu bildirilmiştir. Januszczuk ve diğerleri tarafından İngiltere'de stajyer öğretmenlerle yapılan bir araştırmada öğrencilerin yalnızca %20,5'inin Tip 1 diyabet konusunda bilgi veya eğitim aldığı belirtilmiştir (Januszczuk vd., 2016). Halpern ve Agwu (2018) tarafından Birleşik Krallık'ta yapılan bir başka çalışmada, araştırmaya katılan 156 beden eğitimi öğretmeninden yalnızca %2'sinin Tip 1 diyabetle ilgili yeterli bilgi düzeyine sahip olduğu saptanmıştır (Halpern ve Agwu, 2018). Aycan ve diğerleri tarafından Türkiye'de öğretmenlerle yapılan bir araştırmada, öğretmenlerin %75'inin, diyabetli öğrencilerin beden eğitimi derslerine katılabileceklerini ifade ettikleri belirtilmiştir (Aycan vd., 2012). Alshammari ve Haridi (2021) tarafından Suudi Arabistan'da öğretmenlerle yapılan bir araştırmada Tip 1 diyabetli öğrencinin bireysel olarak spor aktivitelerine tam katılımını kabul edenlerin oranı yalnızca %46,0 olarak belirlenmişti (Alshammari ve Haridi, 2021). Januszczuk ve diğerleri tarafından stajyer öğretmenler ile yapılan bir çalışmada katılımcıların yalnızca %18'inin Tip 1 diyabetle ilgili yeterli düzeyde bilgiye sahip olduğu bildirilmiştir (Januszczuk vd., 2016). Halpern ve Agwu'nun Birleşik Krallık'ta yaptıkları araştırmada, ortaokul beden eğitimi öğretmenlerinin Tip 1 diyabet konusundaki bilgi düzeylerinin düşük olduğu belirlenmiştir. Bu çalışmada beden eğitimi ve spor öğretmeni adayı öğrencilerin çoğunluğunun Tip 1 diyabetle ilgili bilgi/eğitim almaması literatürle uyumludur (Halpern ve Agwu, 2018). Tip 1 diyabet yönetiminde fiziksel aktivite ve egzersizin önemi göz önüne alındığında meslek yaşamlarında Tip 1 diyabetli çocuklarla çalışma olanağı olan öğretmen adaylarının Tip 1 diyabet ve yönetimi ile ilgili bilgi sahibi olması önemli ve gerekli olacaktır.

Bu araştırmada, katılımcıların Tip 1 diyabet ve yönetimi ile "Tip 1 Diyabet Soru Formu"ndan elde edilen total bilgi puanlarının eğitim sonrasında arttığını ve bu artışın eğitimden iki hafta sonra da bilgilerin korunduğu saptandı ($p < 0,05$, Tablo 3). Ayrıca, öğrencilerin "Tip 1 Diyabetle İlgili Akran Eğitimi" öncesi, sonrası ve iki hafta sonraki ölçümlerinde "Tip 1 Diyabet Soru Formu"ndaki 1., 2., 3., 4., 5., 7., 8., 9., 10., 11., 14. ve 16. sorulara verdikleri doğru yanıt oranları arasında istatistiksel olarak anlamlı fark bulundu ($p < 0,05$, Tablo 4).

Öğrencilerin Tip 1 Diyabet Soru Formu'nda yukarıdaki sorulara verdikleri yanıtlardaki doğru oranları eğitim sonrası, eğitim öncesine göre arttığı ve iki hafta sonraki ölçümlerde de verdikleri doğru yanıt oranlarının korunduğu saptandı. Bu sonuçlar, "Tip 1 Diyabetle İlgili Akran Eğitimi"nin beden eğitimi ve spor bölümü öğrencilerine Tip 1 diyabetle ilgili bilgi kazandırmada etkili olduğunu gösterdiği söylenebilir. Benzer şekilde, Assarrar ve arkadaşlarının yaptığı Fas'ta ilkökulda öğretmenlik yapan 346 kişinin katıldığı girişimsel bir çalışmada, eğitim müdahalesi sonrası öğretmenlerin bilgi puanlarında anlamlı iyileşme olduğu bildirilmiştir. Aynı çalışmada öğretmenlerin yaklaşık %40'ının Tip 1 diyabetli çocukların egzersiz yapamayacağına inandığı, %55,5'inin egzersizden önce ek karbonhidrat almanın zorunlu olduğunu düşündüğü bildirilmiştir (Assarrar vd., 2025). Bassi ve arkadaşlarının yaptığı çalışmada İtalya'da çevrimiçi Tip 1 diyabet eğitimine katılan öğretmenlerin Tip 1 diyabet konusunda daha yüksek düzeyde bilgiye sahip olduğu gözlenmiştir (Bassi vd., 2024). Dixe ve diğerleri tarafından Portekiz'de öğretmenler ve okul personeli ile yapılan bir çalışmada, Tip 1 diyabet eğitimi sonrası katılımcıların bilgi düzeylerinde artmayla birlikte öğrencileri destekleme konusunda özgüvenlerinin de arttığı belirtilmiştir (Dixe vd., 2020).

Öğrencilerin "Tip 1 Diyabetle İlgili Akran Eğitimi" öncesi, sonrası ve eğitimden iki hafta sonraki "Tip 1 Diyabet Soru Formu"ndaki 6., 12., 13. ve 15. sorularda üç ölçüm arasında doğru/yanlış oranları arasında istatistiksel olarak anlamlı fark saptanmadı ($p > 0,05$, Tablo 4). Bu sorularda katılımcıların eğitim öncesi yanıtlarında doğru oranlarının görece yüksek olduğu görülmektedir (6.soruda %85, 12.soruda %72,5, 13.soruda %85, 15.soruda %55). Bu sorulardaki katılımcıların eğitim öncesi doğru yanıtlardaki yüksek oranları tavan etkisini (ceiling effect) düşündürülebilir. Katılımcıların ilgili sorulara başlangıç ölçümünde yüksek oranda doğru yanıt vermeleri, müdahale sonrasında ortaya çıkabilecek artışın sınırlı kalmasına ve dolayısıyla istatistiksel olarak anlamlı bir farkın oluşmamasına neden olmuş olabilir.

Bu araştırmada "Tip 1 Diyabet Eğitimi" akran eğitimi modeli kullanarak verilmiştir. Literatürde, çeşitli araştırmalarda, akran eğitiminin katılımcıların/öğrencilerin bilgi ve becerilerini geliştirmede, öğrenme sürecini desteklemede etkili bir yöntem olduğu belirtilmiştir (Ayvacı ve Bebek, 2022; Çulha ve Afşin, 2023). Literatürde, akran eğitim modeli kullanarak öğrencilere yapılan eğitim müdahalelerinin etkinliğini araştıran çalışmalar incelendiğinde, öğretmen adaylarına Tip 1 diyabetle ilgili eğitimin etkinliğini değerlendiren benzer bir araştırmaya rastlanmamıştır. Bu nedenle, akran eğitim modeli ile üniversite öğrencilerine verilen çeşitli konulardaki eğitimlerin etkinliğini değerlendiren araştırma sonuçları ile tartışılmıştır. Bu kapsamda benzer şekilde, Alp Dal ve diğerlerinin yapmış olduğu jinekolojik kanser farkındalığı üzerine yürütülen bir akran eğitimi çalışmasında öğrencilerin bilgi ve farkındalık düzeylerinin eğitimden sonra anlamlı şekilde yükseldiği ve bu artışın bir ay boyunca sürdüğü bildirilmiştir (Alp vd., 2022). Aşçı ve diğerlerinin yaptığı bir çalışmada hemşirelik öğrencilerine verilen üreme sağlığı ile ilgili akran eğitimi katılımcıların bilgi ve farkındalık düzeylerini anlamlı biçimde geliştirmiştir (Aşçı vd., 2016). İldan Çalım ve diğerlerinin sosyal hizmet bölümü öğrencileri ile yaptığı araştırmada, akran eğitimi sonrası cinsel yolla bulaşan hastalıklar konusundaki bilgi puanlarının anlamlı biçimde yükseldiği, akran eğitiminin öğrenmeyi kolaylaştırdığı rapor edilmiştir (İldan vd., 2021). He ve diğerleri tarafından yüksek riskli HIV gruplarında yürüttükleri meta-analiz, akran eğitiminin uzun vadeli davranış değişikliklerini destekleyerek koruyucu sağlık davranışlarını güçlendirdiğini ortaya koymuştur (He vd., 2020).

Çulha ve Afşin'in yaptığı çalışmada, hemşirelik öğrencilerine verilen akran eğitiminin cinsel sağlık konusundaki tutumlarını anlamlı olarak geliştirdiğini göstermektedir (Çulha ve Afşin, 2023).

Bu çalışmada, beden eğitimi ve spor öğretmenliği bölümü öğrencilerine verilen "Tip 1 Diyabetle İlgili Akran Eğitimi"nin öğrencilerin hastalık ve yönetimi ile ilgili bilgi kazanmasında ve bu bilgiyi sürdürmesinde etkili bir yöntem olduğu literatürle uyumludur. Bu sonuçlar, akran eğitiminin tüm yaş gruplarında, özellikle genç yetişkinlerde öğrenmeyi destekleyen, güven temelli bir iletişim ve öğrenme ortamı kurduğunu gösteren özelliklerini desteklemektedir. Bu çalışmada akran eğitimi modeli kronik bir hastalık olan Tip 1 diyabetle ilgili katılımcılara bilgi aktarmada kullanılırken, diğer çalışmada sağlığı koruma ve geliştirme gibi alanlarda da bu eğitim modelinin kullanıldığı görülmektedir. Bu durum akran eğitim modelinin, akut ve kronik hastalık eğitimleri, birinci basamakta sağlığı koruma ve geliştire eğitimleri gibi çok geniş alanda etkili olabileceğini göstermektedir. Araştırma sonucumuz literatürle paralellik göstermekle beraber, akran eğitim modelinin sağlık eğitimi süreçlerinde yaygınlaştırılması gerektiğini ortaya koymaktadır. Ayrıca bu çalışmada Kahoot! uygulaması aracılığı ile yapılan interaktif vaka tartışmalarına (Beyin Fırtınası, Kelime Bulutu) öğrencilerin verdikleri yanıtlar değerlendirildiğinde; vaka tartışmalarının öğrencilerin eğitime olan dikkatlerini arttırma, Tip 1 diyabet ile ilgili bilgilerini pekiştirme ve özellikle Tip 1 diyabetli öğrenciye fiziksel aktivite/egzersiz sürecinde destek olma konularına katkı sağladığı düşünülmektedir.

Öğrencilere Kahoot! uygulaması üzerinden yapılan Quizde 3.sınıf öğrencilerinin total doğru oranı %56,90, 4.sınıf öğrencilerinin total doğru oranı %65,00 bulundu (Tablo 5). Öğrencilerin Quiz sorularına verdikleri yanıtlarda doğru oranların çok yüksek olmamasının olası nedenleri irdelendiğinde; Tip 1 diyabet fizyopatoloji, yönetimi kapsamında insülin uygulaması, sağlıklı ve düzenli beslenme, karbonhidrat sayma, fiziksel aktivite ve egzersizlerin planlanması gibi çok boyutlu ve kompleks bilgileri içermektedir. Bu çalışmada, katılımcılar sağlık bilimleri öğrencisi olmamaları nedeniyle bu kavramların birçoğu ile ilk kez karşılaşılıyor olabilirler. Bu durum, öğrencilerin kısa süreli bir eğitimin ardından tüm bilgilerin tam olarak içselleştirilmesini güçleştirmiş olabilir. Diğer olası bir neden olarak, Kahoot! uygulamasının zaman sınırlı ve hızlı yanıt gerektiren yapısı katılımcıların zaman baskısı nedeniyle hızlı cevap vermelerine neden olarak performanslarını etkilemiş olabilir. Ayrıca, öğrencilerin Quiz sorularına verdikleri yanıtlarda en düşük doğru oranlara sahip sorular, Tip 1 diyabetin fizyopatolojisi ve tedavi alanlarında (glukagon hormonu yanıtı, lipoliz süreci gibi) olduğu görülmektedir. Tip 1 diyabet ve yönetimini içeren karmaşık konular ve katılımcıların sağlık bilimleri öğrencisi olmamaları göz önüne alındığında eğitimin kısa dönemde bilgi artışı sağlamasını sınırlandırmış olabilir.

Sonuç ve Öneriler

Bu çalışmada beden eğitimi ve spor öğretmenliği bölümü öğrencilerine verilen "Tip 1 Diyabetle İlgili Akran Eğitimi"nin öğrencilerin Tip 1 diyabetle ilgili bilgilerini anlamlı olarak arttırdığı ve akran eğitim modelinin etkili bir yöntem olduğu bulundu. Meslek yaşamlarında Tip 1 diyabetli öğrencilerle karşılaşma olanağı olan tüm öğretmen adaylarına Tip 1 diyabet ve yönetimi ile ilgili eğitim oturumları düzenlenmelidir. Ayrıca, çocukların eğitiminden sorumlu olacak eğitim fakültesi programları ve diğer lisans programlarında Tip 1 diyabet gibi çocukluk çağında yaygın görülen kronik hastalık bilgilerini içeren içeriklerin standart olarak müfredat programlarına eklenmesi ya da

eğitim oturumları planlanması önerilmektedir. Ayrıca, gelecek araştırmalarda öğretmen adaylarının Tip 1 diyabet ve yönetimi ile ilgili bilgi düzeylerini değerlendiren standart bir test geliştirilmesi önerilmektedir. Ayrıca, konu ile ilgili kontrol gruplu, randomize, geniş örneklem üzerinde ve uzun izlem süreli çalışmaların yapılması önerilmektedir.

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Teşekkür: TÜBİTAK'a 2209-A Üniversite Öğrencileri Araştırma Projeleri Destekleme Programı kapsamındaki desteklerinden dolayı teşekkür ederiz.

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Ek 1: Tıp 1 Diyabet Soru Formu

Aşağıda Tıp 1 diyabet hastalığı ve yönetimi ile ilgili bilgiler verilmiştir. Lütfen her bir ifadeyi dikkatlice okuyarak her bir ifade için "DOĞRU", "YANLIŞ" ya da "BİLMİYORUM" seçeneklerinden birini "X" ile işaretleyiniz.

	İFADELER	DOĞRU	YANLIŞ	BİLMİYORUM
1	Diyabet hastalığı Tıp 1 ve Tıp 2 olmak üzere 2 ana çeşittir.			
2	Tıp 1 diyabet, genellikle çocuklar ve ergenler arasında daha yaygın olsa da, her yaş grubunda ortaya çıkabilen kronik bir hastalıktır.			
3	Tıp 1 diyabet pankreas organının insülin üretememesi nedeniyle gelişir.			
4	Tıp 1 diyabetin temel nedeni böbreklerin kandaki şekeri süzemesidir.			
5	Tıp 1 diyabetin belirtileri arasında ağız kuruluğu, aşırı kilo kaybı, aşırı susama ve sık sık idrara çıkma yer alır.			
6	Tıp 1 diyabetin tedavisinde insülin kullanımı, dengeli ve sağlıklı beslenme ve düzenli fiziksel aktivite/egzersiz birlikte yer alır.			
7	Terleme, bulanık görme, baş dönmesi ve halsizlik kan şekeri düşüklüğü belirtilerindedir.			
8	Kan şekeri düşüklüğü, diyabetli çocuklar için acil bir durumdur ve uygun müdahale yapılmadığında komaya yol açabilir.			
9	Çok susama, sık sık idrar yapma ihtiyacı ve karın ağrısı kan şekeri yüksekliği belirtilerindedir.			
10	Düzenli fiziksel aktivite/egzersiz, kan şekeri düzeyini normal sınırlarda tutmaya yardımcı olur.			
11	Tıp 1 diyabetli çocuklar, yoğun efor gerektiren fiziksel aktivite/egzersizleri yapamazlar (Örneğin, futbol, basketbol, yüzme vb.)			
12	Fiziksel aktivite/egzersiz yapabilmek için kan şekerinin aşırı düşük veya aşırı yüksek olmaması gerekir.			
13	Tıp 1 diyabetli öğrenciler okulda beden eğitimi ve spor derslerine katılmamalıdır.			
14	Tıp 1 diyabetli öğrenciler akranları gibi fiziksel aktivite/egzersizlere tam olarak katılabilirler.			
15	Tıp 1 diyabetli öğrenciler diğer öğrencilerden farklı bir alanda fiziksel aktivite/egzersiz yapmalıdır.			
16	İdrarda keton olması durumunda fiziksel aktivite/egzersiz ertelenmelidir.			

Global Research on Glycemic Control in Patients with Diabetic Neuropathy Over the Last 20 Years: A Bibliometric Study

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Research Article

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Özet

Son 20 Yılda Diyabetik Nöropatili Hastalarda Glisemik Kontrol Üzerine Küresel Araştırmalar: Bibliyometrik Bir Çalışma

Amaç: Glisemik kontrol, diyabetle ilişkili komplikasyonların önlenmesinde önemli bir tedavi bileşenidir. Yetersiz glisemik kontrol, diyabetin neden olduğu nöropati riskini artırır ve hastalar üzerinde olumsuz fiziksel ve psikolojik etkiler yaratır. Bu bibliyometrik analiz, diyabetik nöropatili hastalarda glisemik kontrol ile ilgili mevcut durumu ve son eğilimleri belirlemek amacıyla yapılmıştır.

Gereç ve Yöntem: 2004 ile 2024 yılları arasında diyabetik nöropatili hastalarda glisemik kontrol üzerine yayınlanan makaleler, "Web of Science Core Collection" veri tabanından elde edilmiştir. Bibliyometrik analiz için VOSviewer ve CiteSpace kullanılmış ve ilgili alandaki önde gelen ülkeler, kurumlar, yazarlar, dergiler ve atıflar analiz edilmiştir.

Bulgular: Araştırmaya toplam 1537 makale dahil edilmiştir. Toplam 94 farklı ülkeden 7693 yazar, 699 dergide diyabetik nöropatide glisemik kontrol üzerine yapılan araştırmalara katkıda bulunmuştur. İlgili alanda yayınlanan makale sayısı yıllar içinde artış göstermiştir. Anahtar kelime eşzamanlılık ağının analizi, bu araştırma alanında en çok kullanılan ilk beş anahtar kelimenin "diyabetik nöropati", "diabet mellitus", "nöropati", "oksidatif stres" ve "hiperglisemi" olduğunu ortaya koymuştur.

Sonuç: Bu çalışma son yirmi yılda diyabetik nöropatili hastalarda glisemik kontrole yönelik araştırma ilgisinin arttığına dikkat çekmektedir. Diyabet komplikasyonlarını önlemenin en temel yolunun glisemik kontrol olduğunu ve hem sağlık profesyonellerinin hem de akademisyenlerin yeni bakım müdahaleleri geliştirmelerini gerekli kıldığını vurgulamaktadır.

Anahtar Sözcükler: Diyabetik Nöropati; Glisemik Kontrol; Bibliyometrik Analiz; Görselleştirme; Araştırma Eğilimleri

Abstract

Objective: Glycemic control is an important treatment component in preventing diabetes-related complications. Poor glycemic control increases the risk of diabetic neuropathy and causes negative physical and psychological effects on patients. This bibliometric analysis was conducted to identify the current status and recent trends related to glycemic control in patients with diabetic neuropathy.

Method: Articles published between 2004 and 2024 focusing on glycemic control in patients with diabetic neuropathy were obtained from the "Web of Science Core Collection" database. VOSviewer and CiteSpace were used to perform bibliometric analysis, and the leading countries, institutions, authors, journals, and citations in the relevant field were analyzed.

Results: A total of 1,537 articles were included. A total of 7,693 authors from 94 different countries contributed to research on glycemic control in diabetic neuropathy in 699 journals. The number of articles published in the related field has increased over the years. Analysis of the keyword co-occurrence network revealed that the top five most used keywords in this research area are "diabetic neuropathy", "diabetes mellitus", "neuropathy", "oxidative stress", and "hyperglycemia".

Conclusion: This study underscores the growing research interest in glycemic control among patients with diabetic neuropathy over the past two decades. It emphasizes that effective glycemic control remains the cornerstone of preventing diabetes-related complications and highlights the need for the development of innovative care interventions by both health professionals and academics.

Keywords: Diabetic Neuropathy; Glycemic Control; Bibliometric Analysis; Visualization; Hotspots

Introduction

Diabetes Mellitus (DM) is a chronic disease that requires continuous monitoring and care. It is characterized by disorders in carbohydrate, protein, and fat metabolism, as well as chronic hyperglycemia resulting from the absence or deficiency of insulin, a hormone secreted by the beta cells of the pancreas (Marathe et al., 2017). DM is one of the most common chronic diseases with high morbidity and mortality worldwide (Lovic et al., 2020). According to the 11th Diabetes Atlas published by the International Diabetes Federation (IDF) in 2025, approximately 589 million adults aged 20–79 years worldwide are living with diabetes, representing 11.1% of the global population. It is projected that the number of individuals with diabetes will reach 853 million by 2050 (IDF, 2025a). In Türkiye, it is estimated that 9.6 million adults were living with diabetes in 2024; this number is expected to increase to 13.3 million by 2045 and 14.1 million by 2050. Furthermore, Türkiye is projected to be among the top ten countries with the highest number of diabetes cases among individuals aged 20–79 years by 2050 (IDF, 2025b).

Macrovascular and microvascular complications develop in patients when hyperglycemia, resulting from the pathophysiological changes caused by diabetes, remains uncontrolled. The lack of optimization of glycemic control leads to diabetic neuropathy (DN), nephropathy, and retinopathy, which affects blood vessels at the microvascular level (Marathe et al., 2017; Dillon et al., 2024). DN is one of the most common complications in both type 1 and type 2 diabetes, and is a neurodegenerative and sensory disorder known to affect an estimated 50% of people with diabetes (Pop-Busui et al., 2022). It is also estimated that by 2045, the number of people with DN worldwide will reach 350 million (Sun et al., 2022). There are forms of DN that lead to different clinical presentations and affect different body systems, such as peripheral neuropathy, autonomic cardiac neuropathy, and urogenital and gastrointestinal neuropathy (Dillon et al., 2024). DN causes damage, especially to the long peripheral neurons that innervate the lower extremities (Pop-Busui et al., 2017). The most common clinical form of DN is distal symmetric polyneuropathy, generally affecting the hands and lower extremities. Clinical symptoms of distal symmetric polyneuropathy include paresthesia with numbness, pins and needles and tingling, burning sensation, pain, muscle weakness, and changes in pain perception (Strand et al., 2024). Risk factors for DN include Glycated hemoglobin A (HbA1c) level, genetics, age, smoking and alcohol use, dyslipidemia, obesity, duration and severity of diabetes, comorbidities, and poor glycemic control (Braffett et al., 2020). Chronic hyperglycemia is the most important risk factor for DN. Chronic hyperglycemia causes mitochondrial dysfunction, oxidative stress, increased reactive oxygen species, and inflammatory cytokines. Additionally, it causes oxidative damage in Schwann cells, progresses the damage to axons, and leads to peripheral nerve dysfunction (Feldman et al., 2017; Callaghan et al., 2020).

Diabetic neuropathy increases the risk of pain, sensory loss, balance disorders, falls, foot ulcerations, and amputations in diabetic patients and further reduces quality of life (Zaino et al., 2023; Dillon et al., 2024). Moreover, increased pain at night causes sleep disturbances, and psychological problems such as stress, anxiety, and depression are commonly observed. (Kioskli et al., 2019; Selvarajah et al., 2019; Kolarić et al., 2022; Fu et al., 2024). Therefore, maintaining optimal glycemic control is the most important goal in preventing the development of complications in people with DM. Glycemic control is a metabolic indicator that includes several parameters such as fasting

plasma glucose, postprandial glucose, and HbA1c. HbA1c has been recognized as the gold standard approach for monitoring glycemic control in the last three months (Casadei et al., 2021). According to the Diabetes Control and Complications Study, an HbA1c value <7% is associated with the prevention of microvascular complications such as neuropathy, retinopathy, and nephropathy (Rodríguez-Gutiérrez and Montori, 2016). Each 1% reduction in HbA1c reduces the risk of microvascular complications, diabetes-related death, and myocardial infarction (Sartore et al., 2023). One of the most important behavioral and therapeutic goals in ensuring glycemic control is to improve patients' self-management abilities. When the studies in the literature are evaluated, it is seen that effective glycemic control is an important component in preventing various types of neuropathy in both type 1 and type 2 DM (Ang et al., 2014; Mizokami-Stout et al., 2022; Achmad et al., 2023).

When the literature is reviewed, it is seen that there is no bibliometric analysis on glycemic control in DN patients. This bibliometric analysis examined articles on the relationship between diabetes-related neuropathy and glycemic control, aiming to identify research trends and uncover gaps in the existing literature. It is considered that the studies examining glycemic control in patients diagnosed with DN will contribute to the knowledge of nurses on the subject and the development of innovative methods for studies on the subject.

Materials and Methods

Research Questions

This study aimed to answer the following questions:

- What was the annual rate of publication change of DN and glycemic control articles?
- What were the most prolific and influential authors, countries, and institutions in association between DN and glycemic control?
- What were the most frequent research keywords and themes on DN and glycemic control?
- What were the citation analysis results on DN and glycemic control?

Study Design

This study was a descriptive bibliometric research study. This study was reported according to the BIBLIO checklist. Bibliometric analysis is a type of quantitative analysis that summarizes academic publications on a specific research topic using various statistical methods by visualizing the developments, highlights, and trends related to that topic with network analysis (Donthu et al., 2021). The authors, countries, institutions, journals, and number of citations that are highlighted in the research theme are evaluated by using co-word analysis, social network analysis, or cluster analysis methods used in the bibliometric analysis process (Marzi et al., 2025).

Data Sources, and Search Strategy

In this study, the Web of Science Core Collection (WoSCC) database was utilized as the data source. WoS is one of the comprehensive databases of high-quality academic works worldwide and is widely used in bibliometric analyses (Lv et al., 2023). Data were obtained from WoS on March 3, 2025, and the search was completed on the same day to avoid potential changes in the database. The data search strategy was as follows: TS (Topic Search)= ("diabetic neuropathy" OR "peripheral diabetic neuropathy" OR "diabetic polyneuropathy" OR "

diabetes-related neuropathy") AND ("glycemic control" OR "glucose control" OR "blood glucose control" OR "blood glucose regulation" OR "HbA1c" OR "glycated hemoglobin" OR "hyperglycemia" OR "hypoglycemia" OR "diabetes management" OR "glycemic variability"). The period was set from 2004 to 2024. The study followed specific inclusion and exclusion criteria. Inclusion criteria were as follows: (1) document type included original research and review articles, (2) written in English, and (3) articles retrieved from WoS. Exclusion criteria were as follows: (1) articles not formally published; (2) articles irrelevant to the topic; (3) early access, meeting abstract, editorial materials, proceedings, book sections, letter to the editor. A total of 1,642 records were initially retrieved. After applying the inclusion and exclusion criteria, 1,537 publications, including 1,252 original articles and 285 review articles, were included in the bibliometric analysis. The data acquisition diagram is shown in Figure 1.

Data Collection

All data were extracted in tab-delimited file format from the WoS database and exported into Excel 2020. In this context, all data from 1,537 articles selected following the study's defined inclusion and exclusion criteria were downloaded. Each data in the database was categorized as follows: article title, authors, journal title, year of publication, keywords, abstract, references, and organization. Missing data of the articles in any category were reviewed, and missing data were filled in by the authors. If missing data of the articles were not obtained, the articles were excluded from the analysis. Finally, the reviewed data were transferred to the software where the analyses were conducted.

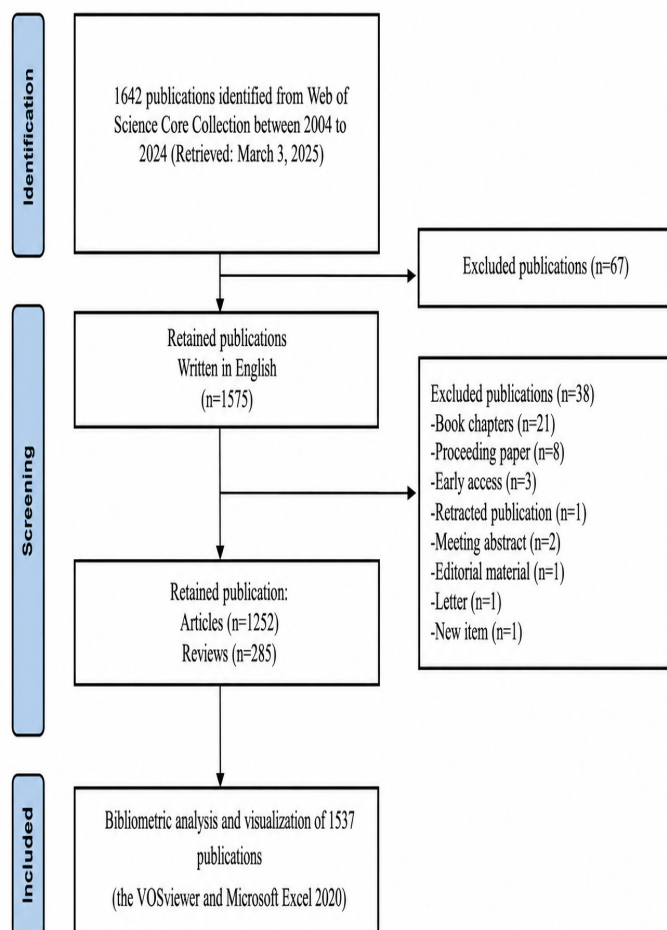


Figure 1. Flowchart of the publications screening and analysis process

Data Analysis

The data analysis was conducted by VOSviewer software (version 1.6.20) and CiteSpace (version 6.3.R1) to perform bibliometric analyses, create network maps, and visualize different parameters. VOSviewer is a powerful visualization tool widely used in the analysis of academic publications and their associated networks (van Eck and Waltman, 2010). This software is especially selected for citation analysis, keyword relationships, author collaboration analysis, and visualization of publication networks. VOSviewer offers features such as network visualization, overlay visualization, and density visualization. The exported data files were converted into a text file with a txt extension and analyzed. The bibliometric analyses and visualizations performed with VOSviewer software contributed to the systematic examination of publications in the research area and helped to identify academic productivity, collaborations, and important trends in the literature.

CiteSpace software is a scientific literature analysis tool developed by Dr. Chaomei-Chen and is based on Java (Synnstedt et al., 2005; Chen, 2006). The visual maps created by CiteSpace include links, nodes, and clusters. Nodes include authors, institutions, journals, keywords, and organizations. CiteSpace is capable of identifying research hotspots and trends in popularity across various periods through keyword burst analysis, analyzing the development trends (Chen, 2006). CiteSpace facilitates the identification of research trends over the years, current research trends on the hot topic, and the creation of a comprehensive database that will contribute to the development of future studies in that field. In this context, variables such as the distribution of articles by year, the countries where they were published, the number of citations they received, the journals in which they were published, and the keywords used were evaluated.

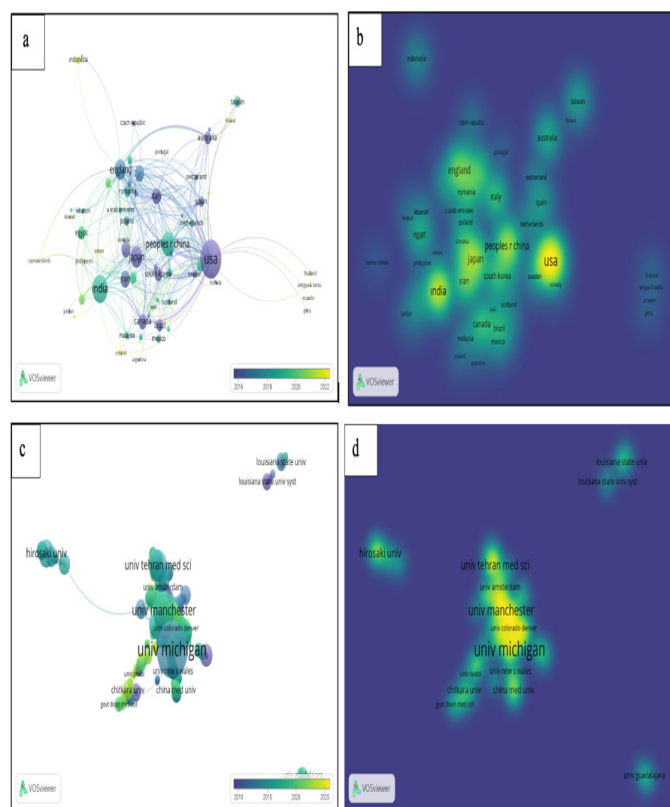


Figure 2. Overlay visualization map of countries co-authorship analysis (a). Density visualization map of countries co-authorship analysis (b). Overlay visualization map of institutions co-authorship analysis (c). Density visualization map of institutions co-authorship analysis (d)

Results

Preliminary Information About the Data

In our study, VOSviewer, CiteSpace, and Microsoft Excel 2020 were used to analyze the temporal change and trend of annual publications on DN and glycemic control over the last 20 years. A total of 1,537 articles published by 7,693 authors from 94 different countries were included in the analysis. These articles were published in 699 different journals.

Trends in Annual Publications and Citations

From 2004 to 2024, the global trend is that the number of studies on DN and glycemic control has increased, although there have been fluctuations in certain periods (Table 1). In recent years, there has been a significant increase in the number of studies in the related field. Table 1 shows that the highest number of articles was published in 2024 (n=130), and the lowest number of articles was published in 2005 (n=30). Over the last five years, an average of 121.6 articles have been published annually, indicating a growing academic and clinical interest in the relationship between DN and glycemic control. The data reveals that this research area continues to maintain an important place in the scientific literature and that academic productivity in this field continues.

Table 2 shows the annual number and citations of articles published in the relevant field. In 2024, the highest point was reached in terms of both the number of publications (n=130) and citations (n=6296), indicating a potential increase in the quality of articles compared to previous years. The most cited publication was Tesfaye et al. 'Vascular risk factors and diabetic neuropathy' with a total of 953 citations (Tesfaye et al., 2005).

Table 1. Trends of Publications by Year

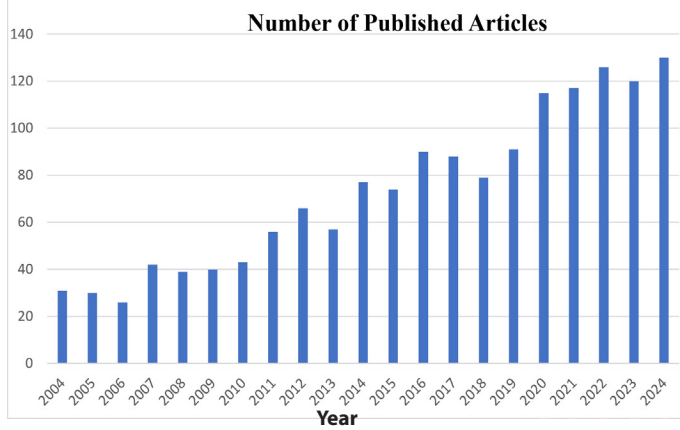
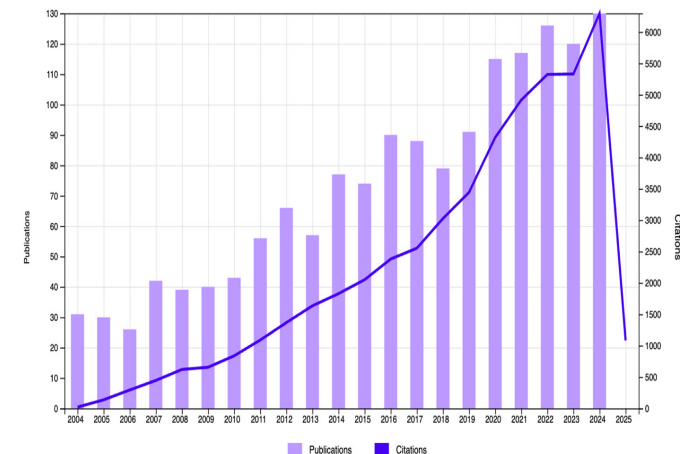


Table 2. Trends of Annual Publications and Citations



Analysis of the Countries/Institutions

From 2004 to 2024, studies analyzing the relationship between DN and glycemic control were conducted in 94 countries. The United States of America (USA), which stands out in terms of publication volume and research intensity, is the country with the highest impact, contributing 22.25% of the total research output. India ranks second with 187 article publications and a contribution level of 12.16%, while China ranks third with a contribution rate of 9.04% (139 articles). These countries are followed by Japan, the UK, Iran, and Turkey, and there is widespread geographical involvement in the topic (Figure 2). When the co-authorship analysis of various institutions is analyzed, the University of Michigan has the highest number of publications (n=67) and citations (n=8562) on DN and glycemic control. University of Manchester ranks second with 32 publications and 2,276 citations. These universities are followed by the Tehran University of Medical Sciences, Aarhus University, and Aarhus University Hospital (Table 3, Figure 2).

Table 3. Top Five Countries and Institutions by Number of Publications on Diabetic Neuropathy and Glycemic Control

Rank	Countries	Publications	Citations
1	USA	341	21046
2	India	178	4161
3	China	136	3460
4	Japan	110	2944
5	England	94	6343
Institutions			
1	University of Michigan	67	8562
2	University of Manchester	32	2276
3	Uni Tehran Med Sci	21	867
4	Aarhus University	18	744
5	Aarhus University Hospital	17	398

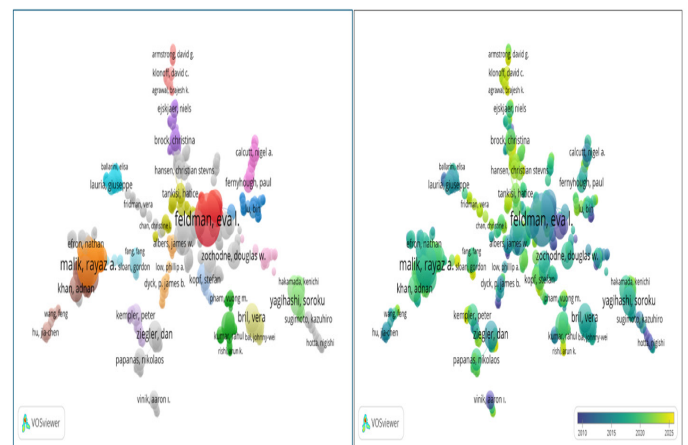


Figure 3. Network visualization of core authors

Analysis of the Authors

In the author co-citation analysis, the most productive authors in the field are determined, and the authors who have contributed to the development of research focuses are shown in the form of a network map (Donthu et al., 2021). In total, 7,693 different authors published 1,537 articles on DN and glycemic control between 2004 and 2024. To visualize the collaboration between authors, a network map was created using the VosViewer program (Figure 3). The most productive author in the related field is Feldman, Eva, who is highlighted as the author with the highest number of publications with a total of 38 articles. Feldman, Eva is followed by Malik, Rayaz (n=27) and Pop-busui, Rodica (n=17). The first most cited author is Feldman, Eva, with 5213 citations. Pop-busui, Rodica (n=2223) ranked second, and Malik, Rayaz A (n=2075) ranked third. These data are presented in detail in Table 4 and provide quantitative data on the productivity of the authors and their impact on the field.

Table 4. Top 5 Most Productive Authors in the Diabetic Neuropathy and Glycemic Control Field From 2004 to 2024.

Rank	Author	Documents	Citations	Average citation/publication
1	Feldman, Eva	38	5213	137.18
2	Malik, Rayaz A	27	2075	76.85
3	Pop-busui, Rodica	17	2223	130.76
4	Ponirakis, Georgios	16	648	40.5
5	Bril, Vera	12	906	75.5

Analysis of the Journals

Scientific studies on DN and glycemic control have been published in many journals, contributing to the relevant literature. Analyses conducted between 2004 and 2024 revealed that a total of 699 articles were published in this field in different journals.

VOSviewer software was used to analyze the relationships between journals. By analyzing the links between authors and articles, this software visualized the scientific communication networks between journals and the density of these networks. The resulting network visualization shows both the prominent journals in the field and the interactions between journals in detail (Figure 4).

Journal of Diabetes and its Complications had the highest number of publications at 39, as shown in Figure 4. The second journal with the highest number of publications on DN and glycemic control is the *Journal of Diabetes Investigation* (n=29), and the third is *Plos One* with 25 articles. These three journals are in a central position in terms of both the number of publications and their scientific contributions in the field, and they shape the developments in the research field (Table 5).

Table 5. The Number of Publications in the Top 10 Journals in the Diabetic Neuropathy and Glycemic Control Research Field

Rank	Source	Publication	Citations	Average citation/publication
1	Journal of Diabetes and Its Complications	39	1237	31.71
2	Journal of Diabetes Investigation	29	1134	39.10
3	Plos One	25	591	23.64
4	Frontiers in Endocrinology	22	399	18.13
5	Cureus Journal of Medical Science	19	161	8.47
6	Current Diabetes Reviews	17	352	20.70
7	Diabetes Research and Clinical Practice	17	396	23.29
8	International Journal of Molecular Sciences	16	322	20.12
9	Diabetes	15	1355	90.33
10	Diabetes Care	15	1695	113

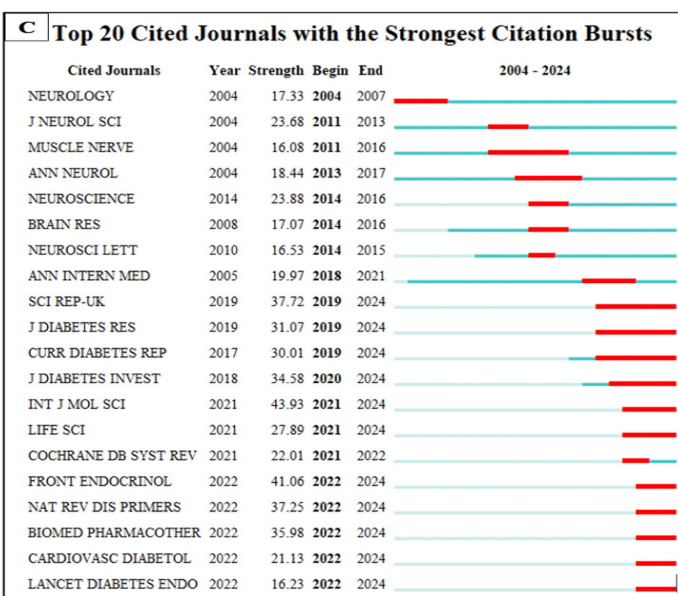
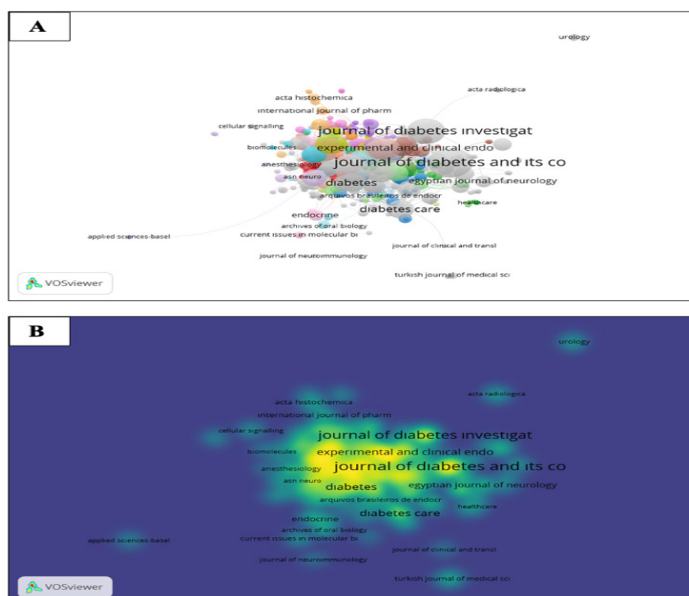


Figure 4. Visualization of the published journal network (a). Density visualization map of published journal (b). The top 20 journals with the strongest citation bursts based on CiteSpace. The blue line stands for the overall time span of publications from 2004 to 2024. The red line represents the time interval of a specific burst journal. (c)

Analysis of the Top 10 Journal with the Strongest Citation Bursts

Using CiteSpace, a burst detection analysis was conducted to track evolving trends within global research from journals publishing on glycemic control in patients with DN over the period 2004-2024, as illustrated in Figure 5. This analysis shows the trend of academic journals publishing the most articles on the relevant topic. Especially in the last 10 years, "Journal of Diabetes Research", "Current Diabetes Reviews", "Journal of Diabetes Investigation", "Science Reports-UK", "Frontiers In Endocrinology" and "International Journal Of Molecular Sciences" are among the prominent journals.

Analysis of the Keywords

Keyword analysis was utilized to identify the main focus of research in the field of DN and glycemic control. Table 6 lists the five most frequently used keywords between 2004 and 2024. As a result of the analysis, the most frequently used keyword was Diabetic neuropathy (n=488). It is followed by Diabetes Mellitus (n=225) and Neuropathy (n=142), respectively.

Table 6. Top 5 Co-Occurrence Keywords in the Diabetic Neuropathy and Glycemic Control Field From 2004 to 2024.

Rank	Keyword	Occurrences	Total link strength
1	Diabetic neuropathy	488	1819
2	Diabetes mellitus	225	977
3	Neuropathy	142	586
4	Oxidative stress	96	428
5	Hyperglycemia	78	401

Analysis of Top 10 Keywords with the Strongest Citation Bursts

Using CiteSpace, a burst detection analysis was conducted to track evolving trends within global research on glycemic control in DN patients over the period 2004 to 2024, as illustrated in Figure 5. This analysis reveals focus points in global research. In recent years, there has been a decline in interest in keywords such as "polyneuropathy", "alpha-lipoic acid", "risk factor", "complications", and "sensory neuropathy". Conversely, in the last 10 years, the keywords "diabetic polyneuropathy", "microvascular complications", "diabetic retinopathy," and "risk" have come to the fore and emerged as areas of increasing academic interests.

Ethics Committee Approval

This study did not require ethics committee approval, as it involved the analysis of previously published articles and publicly accessible data. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Discussion

In this study, a bibliometric analysis of 1,537 studies on DN and glycemic control published in the WoS database between 2004 and 2024 was performed using Vosviewer and CiteSpace programs. A review of the literature reveals that no bibliometric analysis study has been conducted to examine the leading countries, journals, influential authors, and emerging trends in DN and glycemic control. This highlights the originality and significance of the present study. Therefore, this study will help researchers and clinicians to identify scientific outputs, citation trends, and key points related to glycemic control in DN patients.

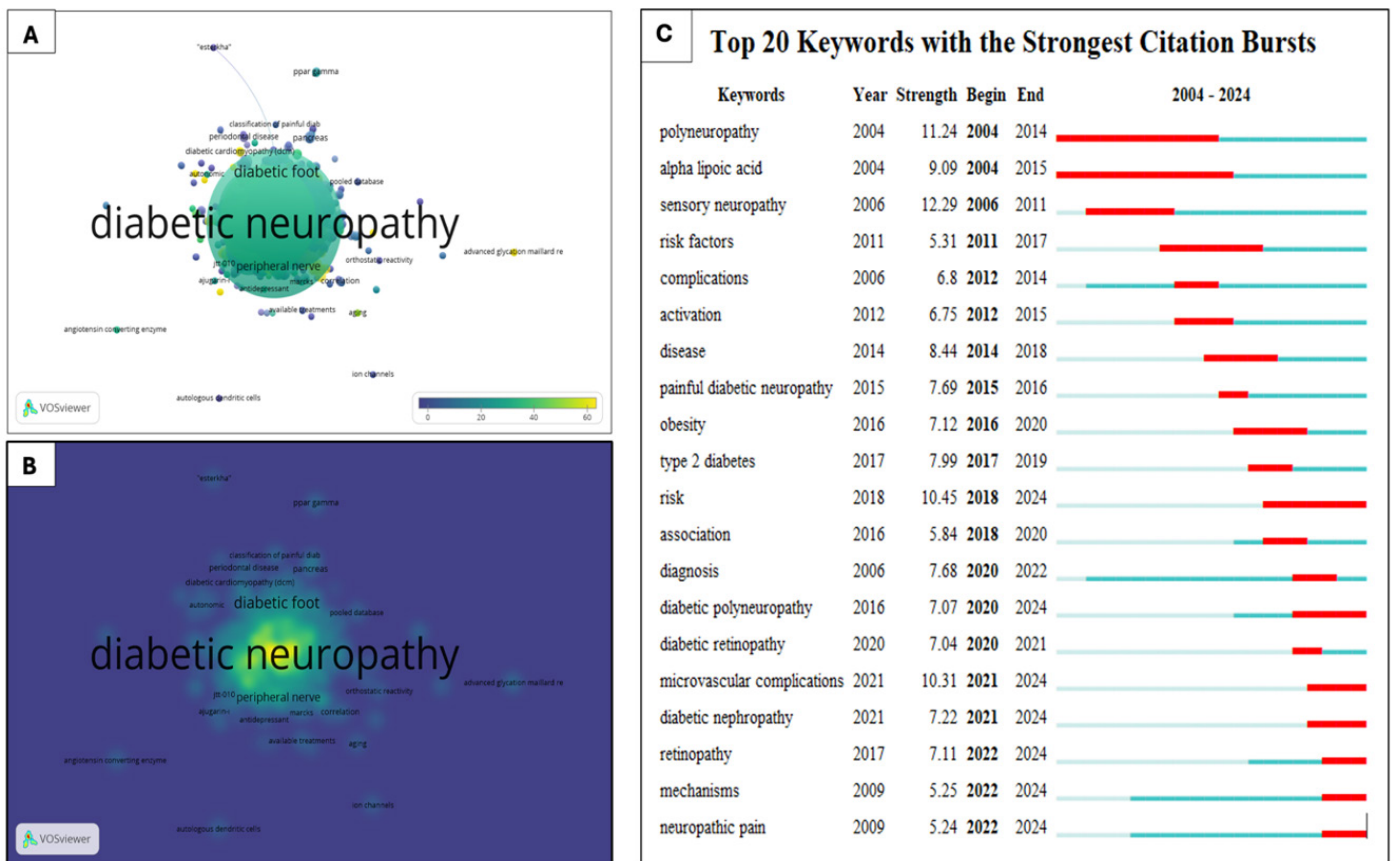


Figure 5. Keywords co-occurrence overlay visualization map (a). Keywords co-occurrence density visualization map (b). The top 20 keywords with the strongest citation bursts based on CiteSpace. The blue line stands for the overall time span of publications, from 2004 to 2024. The red line represents the time interval of a specific burst word (c)

Additionally, it is expected that this study will shed light on identifying gaps in the existing literature and determining which aspects should be emphasized in future research.

According to the bibliometric analysis, studies on glycemic control in DN have increased over the last 20 years, particularly in 2024. The increasing number of publications in this field over the years has contributed to a comprehensive body of literature on the research area. In addition to the fact that DM is a public health problem with a rapidly increasing incidence worldwide, the increasing incidence of DN, which is one of the microvascular complications of DM despite the diversity of treatment methods, may be effective in maintaining interest in the field (Bondar et al., 2021). Hyperglycemia is one of the most important factors leading to an increase in the worldwide prevalence of DN. To prevent hyperglycemia, establishing patient-specific glycemic goals, promoting blood glucose monitoring behaviors aligned with these goals, and enhancing self-management skills play a crucial role in improving patients' quality of life (Abu-Shennar et al., 2022). In addition, interventions to alleviate the burden of symptoms such as pain, decreased functional capacity, limitation of physical activity, foot ulcerations and amputation that develop in patients caused by DN, as well as the implementation of new treatment methods, may contribute to keeping DN research up to date (Bondar et al., 2021; Savelieff et al., 2025).

It was determined that the studies examining the association between DN and glycemic control were conducted by authors from 94 different countries. As a result of the network analysis, the three countries with the highest number of published articles in the field were the United States, India, and China. These countries are followed by Japan, the UK, Iran, and Turkey. The estimated prevalence of DN among adults with diabetes in the United States is known to be 28% (Pop-Busui et al., 2017). The prevalence of DN ranges between 20-30% for Type 1 and Type 2 DM, with differences between geographical regions. The high publication output of China and India may also be associated with their large diabetes burden and increasing investments in biomedical research. According to the data from IDF, the prevalence of diabetic peripheral neuropathy in adults with diabetes is estimated to be 12.6% in Australia, 30.4% in Russia (a European country,) and 19.9% in Egypt (a Middle Eastern country). Additionally, Africa has the highest proportion of adults unaware of their diabetes status at 53.6%. Africa is followed by the Western Pacific at 52.8% and Southeast Asia at 51.3% (IDF, 2021a). Particularly in people with Type 2 DM and those in the asymptomatic preclinical stage, elevated fasting glucose levels constitute a significant risk factor for diabetes-related macrovascular and microvascular complications (Ang et al., 2014; Mohammadi et al., 2017). Healthcare expenditures related to diabetes and DN are also increasing rapidly, with the total global cost of diabetes care projected to rise to US\$2.48 trillion by 2030 (Savelieff et al., 2025). Therefore, achieving optimal glycemic control in patients during the prediabetic stage is crucial for preventing complications (Ang et al., 2014; Mohammadi et al., 2017). Collaboration between researchers and practitioners with authors from different countries is also of great importance for the standardization of evidence-based practices at the global level.

A total of 2,783 different institutions that contributed to studies on DN and glycemic control were identified and it was revealed that universities being the leading contributors. The University of Michigan has been found as the most productive and influential institution in this research area, with 67 publications

and 8,562 citations. It is followed by the University of Manchester, with 32 publications and 2,276 citations, and Tehran University of Medical Sciences, with 21 publications and 867 citations. As in the country contribution ranking, it is remarkable that the institution contributing the most to the research field is a university in the USA. Multinational, multicenter, and multidisciplinary studies should be conducted, and cooperation of different institutions should be provided to reduce the increasing burden of untreated diabetes, especially in low- and middle-income countries (Hossain et al., 2024).

According to the authors' network analysis, a total of 7,693 authors participated in research on DN and glycemic control. Feldman, E is the most prolific author in the area with 38 publications and 5213 citations. The second most prolific author is Malik, R (27 publications, 2075 citations), and the third most prolific author is Pop-busui, Rodica (16 publications, 648 citations). The quality of research can be improved by strengthening collaboration between authors publishing on DN and glycemic control, by sharing up-to-date information, and by utilizing resources collectively.

The 1,537 original research and review articles included in our bibliometric analysis were published in 699 different journals. Journal analysis and citation network analysis showed that, *Journal of Diabetes and Its Complications* is the journal with the highest number of articles on DN and glycemic control with 39 publications. *Journal of Diabetes Investigation* ranks second with 29 publications in the area and Plos One ranks third with 25 publications. *Diabetes Care* was the most cited journal in the area of DN and glycemic control with 1,695 citations. Following the results obtained, studies in this field in the last 20 years have been published in high-quality journals and are of high interest. Researchers who want to work on glycemic control in DN should examine these journals with the highest number of publications and citations.

Keyword network analysis indicated that the keywords "diabetic neuropathy", "diabetes mellitus", "neuropathy", "oxidative stress", and "hyperglycemia" were commonly used in 1,537 articles published on DN and glycemic control between 2004 and 2024. The burst analysis shows that the keywords "sensory neuropathy", "polyneuropathy", "risk", "microvascular complications," and "alpha-lipolic acid" have been the focus of studies in the relevant field over the last 20 years. This type of keyword analysis is also critical for identifying research gaps and potential study topics in the field. Especially for future research, these keywords can potentially serve as a guide for researchers (Hassan and Duarte, 2024; Marzi et al., 2025).

Conclusion

This study is an in-depth bibliometric analysis of glycemic control in patients with DN and reveals the current status, publication trends, research hotspots, top contributing countries, authors, and journals. The results of the bibliometric analysis show that there has been an increased interest in DN in the last 20 years. According to our bibliometric analysis, it was determined that the most articles in the field were published in 2024, the USA was the most productive country, the University of Michigan was the most productive institution in terms of the number of publications, and Feldman, Eva is the most influential author. The highest number of studies included in the bibliometric analysis focused on the keywords "diabetic neuropathy", "diabetes mellitus", "neuropathy", "oxidative stress" and "hyperglycemia". Despite these insights, the development of appropriate interventions to achieve glycemic control in patients

with DN has gaps that necessitate further investigations. In this regard, increasing global collaborations in studies investigating DN and glycemic control and focusing on relatively under-addressed topics will lead to more academic exploration. This will also contribute to improving the quality and effectiveness of nursing care for patients with DN.

Strengths and Limitations

To our knowledge, this is the first bibliometric analysis assessing glycemic control in patients with DN. This study revealed the research trends, productivity, collaborations, and global highlights of researchers, academics, and clinicians on DN and glycemic control. There were some limitations in this study. First, only publications in the “Web of Science Core Collection” database were included in the literature review. Therefore, the results may not be comprehensive as not all publications on this topic were included. Second, only research and review articles were included in this bibliometric analysis. Third, only articles published in English were included in the analysis, which may limit the generalizability of our results.

Conflict of interest: The authors declare no conflict of interest.

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Author Contributions: All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by BG, HS, and FTY. The first draft of the manuscript was written by BG, and all authors commented on previous versions of the manuscript. All authors read and approved the final version of the manuscript.

Ethics Approval: Ethics committee approval was not required because this study was conducted using publicly available bibliometric data from previously published articles.

Informed Consent: Not applicable.

Availability of Data and Materials: The data used in this study were obtained from the Web of Science Core Collection database. The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

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A Bibliometric Analysis of Research on Diabetes in Nursing: A Retrospective Descriptive Study

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Özet

Hemşirelik Alanında Diyabetle İlgili Araştırmaların Bibliyometrik Analizi: Retrospektif Tanımlayıcı Bir Çalışma

Amaç: Bu çalışmada, 2013–2023 yılları arasında hemşirelik alanında diyabetle ilgili yayımlanan araştırmaların bibliyometrik açıdan incelenmesi ve bulguların görsel haritalama ile sunulması amaçlanmıştır.

Gereç ve Yöntem: Veriler Haziran 2024 tarihinde "Web of Science Core Collection (WoS)" veri tabanı kullanılarak toplanmış, veri analizi için VOSviewer 1.6.19 yazılım programı kullanılmıştır. Bibliyometrik analizde yıllara göre sayısal dağılım, öne çıkan ülkeler, en fazla yayın yapılan dil, etkin olan kurumlar, atıf analizi ve öne çıkan araştırmacılar analiz edilmiştir.

Bulgular: WoS Core Collection veri tabanındaki toplam 2.408 yayın arasından 112 makale araştırmacının örneklemini oluşturmuştur. 112 çalışmaya 21 ülkeden 200 yazar katkı sağlamıştır. "Nurse Practitioner" en fazla makalenin yayımlandığı (n = 36). En fazla atıf alan iki makalenin Nursing Research and Practice ve BMC Nursing dergilerinde yayımlandığı belirlenmiştir. Yapılan araştırmalara en çok destek veren Amerika Birleşik Devletleri'dir. Çalışmalarda en fazla kullanılan anahtar kelimeler "diabetes mellitus", "nursing", "type 2 diabetes mellitus", "diabetes" ve "primary care" olarak belirlenmiştir.

Sonuç: Bu bibliyometrik analizden elde edilen bulgular, hemşirelerin son on yılda özellikle diyabet, tip 2 diyabet ve birinci basamak sağlık hizmetleri alanlarında çalışmalarına yoğunlaştığını ve bu konulara yönelik ilgilerinin arttığını göstermektedir. Bu durum farklı araştırma alanları ile diyabet üzerinde yapılacak daha fazla çalışmaya ihtiyaç duyulduğunu ortaya koymaktadır.

Anahtar Sözcükler: Bibliyometri; Hemşirelik; Diyabeti

Abstract

Objective: This study aimed to perform a retrospective bibliometric analysis of publications on diabetes in nursing between 2013 and 2023. Using document analysis, it aimed to identify publications within this period and to present the findings through visual representations.

Method: Data were retrieved in June 2024 from the Web of Science Core Collection (WoS) database, and analyses were conducted using VOSviewer (version 1.6.19). The bibliometric evaluation included annual publication trends, leading countries, most frequent publication languages, active institutions, citation analyses and prominent researchers.

Results: Out of 2,408 publications indexed in the WoS Core Collection, 112 articles were included in the sample. A total of 200 authors from 21 countries contributed to 112 studies. Nurse Practitioner was identified as the journal publishing the highest number of articles (n = 36). The two most highly cited articles were published in Nursing Research and Practice and BMC Nursing. The United States was the country with the highest number of publications. The most commonly used keywords were "diabetes mellitus", "nursing", "type 2 diabetes mellitus", "diabetes" and "primary care."

Conclusion: The findings from this bibliometric analysis indicate that, over the past decade, nurses have increasingly concentrated their work on diabetes, particularly type 2 diabetes, as well as on primary health care, reflecting a growing interest in these areas. This trend underscores the increasing engagement of nurses in these fields and highlights the need for further studies on diabetes across diverse research domains.

Keywords: Bibliometrics; Nursing; Diabetes mellitus

Introduction

Diabetes is a chronic metabolic disease characterized by elevated blood glucose levels, which, over time, can cause severe damage to the heart, blood vessels, eyes, kidneys, and nerves (WHO, 2023). According to the 11th Diabetes Atlas published in 2025 by the International Diabetes Federation (IDF), approximately 588 million people worldwide are living with diabetes, three out of four of whom reside in low- and middle-income countries. Furthermore, an estimated 3.4 million deaths annually are directly attributable to diabetes. Both the incidence and prevalence of diabetes have steadily increased over the past several decades (IDF, 2025). National data from 2021 indicate that 9.6 million individuals in Türkiye were diagnosed with diabetes, and the global number is projected to reach 852 million by 2050 (IDF, 2025). These figures underscore the urgent need for effective, multidisciplinary approaches to diabetes prevention, management, and education.

Nursing care plays a critical role in the management of metabolic parameters and treatment outcomes in patients with diabetes. Nurses are uniquely positioned to assess individual characteristics and diabetes-related attitudes that influence patients' self-efficacy, thereby guiding effective diabetes care management. Beyond clinical monitoring, nurses empower individuals with diabetes through structured educational interventions aimed at fostering positive self-care behaviors and improving long-term health outcomes. In recent years, the expanding role of nurses in diabetes care has been further shaped by advances in digital health technologies, telehealth applications, and nurse-led care models. Studies have demonstrated that nurse-led telehealth interventions significantly improve glycemic control and patient self-management in type 2 diabetes (Dat et al., 2024; Eberle & Stichling, 2021). Similarly, structured diabetes education programs delivered by nurses have been shown to enhance patients' knowledge, self-efficacy, and adherence to treatment regimens, highlighting the pivotal role of nursing in diabetes care across diverse settings (Gün & Tülüce, 2024).

As the volume of diabetes-related nursing research continues to grow, synthesizing this expanding body of literature becomes increasingly important. Bibliometric analyses are systematic, quantitative methods used to evaluate large datasets in order to reveal the intellectual structure, collaborative networks, and developmental trajectories of research within a specific field (Donthu et al., 2021). In the health sciences, bibliometric approaches have been widely adopted to map research trends, identify influential contributors, and highlight gaps in the literature across various nursing subspecialties (Kara Çiğdem et al., 2023). Such analyses are particularly valuable in nursing research, where evidence-based practice requires not only the generation of new knowledge but also a structured understanding of how that knowledge has evolved over time.

Despite the growing body of diabetes-related nursing research, a comprehensive bibliometric analysis specifically focused on this intersection has not yet been identified in the literature, based on searches conducted across Web of Science and related databases. Addressing this gap, the present study aims to conduct a bibliometric analysis of diabetes-related research in nursing published between 2013 and 2023. Specifically, the study seeks to examine annual publication trends, leading countries and institutions, prominent authors, journal distributions, citation patterns and keyword co-occurrence networks. The findings are expected to provide researchers, clinicians, and policymakers with a structured overview of the

current state of knowledge and to inform priority directions for future evidence-based nursing practice in diabetes care.

Materials and Methods

Study Design

Bibliometric analysis is a scientific method that systematically examines research trends, authors, countries, journals, and key themes within a specific field using quantitative and qualitative approaches, thereby providing a comprehensive understanding of the discipline's scientific dynamics (Donthu et al., 2021). This study was conducted retrospectively using the document analysis method and covered a 10-year period between 2013 and 2023. Bibliometric analysis was performed using VOSviewer (version 1.6.19), which facilitates the mapping and visualization of data through techniques such as co-citation, bibliographic coupling, co-authorship, and keyword co-occurrence. The study aimed to identify and visually map articles on diabetes in nursing published during this period.

Bibliometric analysis was performed using VOSviewer (version 1.6.19). In the keyword co-occurrence analysis, the association strength normalization method was applied, which is the default and recommended normalization method in VOSviewer, as it corrects for differences in the total number of co-occurrences between items. A minimum occurrence threshold of three was set for keywords. Full counting method was used for all network analyses. Clustering was performed using VOSviewer's built-in clustering algorithm based on the modularity-based approach, with a resolution parameter of 1.0. Network visualizations were generated using the default VOS mapping technique, in which the distance between two items reflects the strength of their relationship.

Although the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram was originally developed for systematic reviews, its use in bibliometric studies has been increasingly adopted in recent literature to enhance transparency and reproducibility in the reporting of literature search and selection processes (Donthu et al., 2021). Accordingly, the study selection process was reported in accordance with the PRISMA flow diagram (Figure 1).

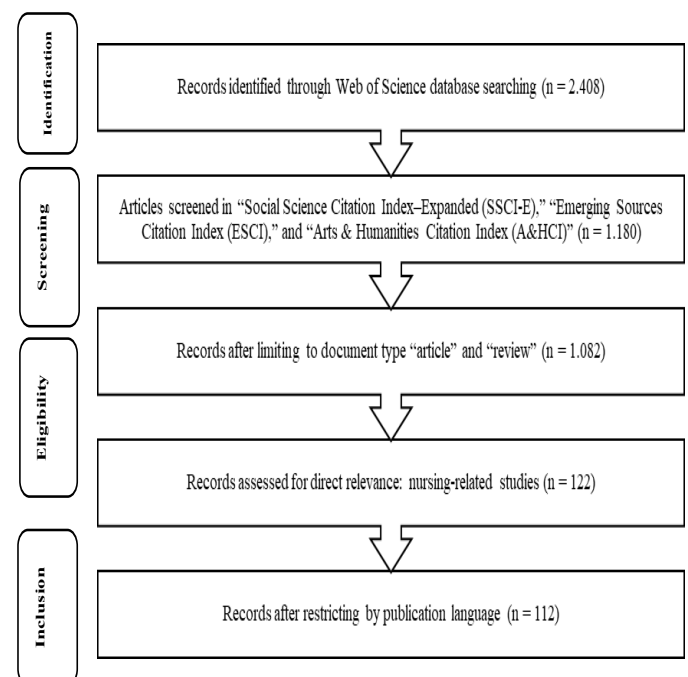


Figure 1. PRISMA Flow Diagram

Data Collection

Data were retrieved in June 2024 from the Web of Science Core Collection (WoS) database, which compiles international research publications. The Web of Science Core Collection was selected as the primary data source because it is one of the most comprehensive and widely used databases for bibliometric analyses, offering standardized metadata and reliable citation information. Although databases such as Scopus, PubMed and CINAHL also index nursing and diabetes literature, the scope of this study was intentionally limited to the Web of Science Core Collection to ensure consistency in data extraction and citation analysis; this restriction is acknowledged as a limitation.

The search was conducted using the keywords "diabetes" AND "nursing" in the topic field, and publications were restricted to the period between 2013 and 2023, with the document type limited to "articles" and "reviews". The database search was confined to the SCI-Expanded, A&HCI, and ESCI indices. These indices were selected to ensure the inclusion of internationally recognized and high-quality publications. Only publications in English were included. Out of a total of 2.408 publications, 112 articles met the inclusion criteria and constituted the study sample.

Inclusion and Exclusion Criteria

Inclusion criteria were as follows: (1) studies focusing on diabetes in the context of nursing practice, education, or research; (2) published between January 1, 2013, and December 31, 2023; (3) written in English; (4) classified as original research articles or review articles; and (5) indexed in the Web of Science Core Collection under the subject category "Nursing." Exclusion criteria comprised book chapters, conference proceedings, case reports, commentaries, and letters to the editor.

A comprehensive database search using the keywords "diabetes" and "nursing" initially yielded 2.408 publications. The search was conducted between June 1 and June 8, 2024. Following the application of index filters (SCI-Expanded, A&HCI and ESCI), 1.180 publications were identified. When further restricted to the Web of Science subject category "Nursing" 122 studies were identified. Publications not written in English, including Spanish (n = 5), Portuguese (n = 3), and French (n = 2) were excluded, resulting in a final sample of 112 studies. The study selection process is presented in Figure 1.

Data Analysis

For the bibliometric data analysis, VOSviewer (version 1.6.19) was used. The software enables the analysis and visualization of bibliometric networks through co-citation analysis, bibliographic coupling, co-authorship analysis, and keyword co-occurrence analysis (Dirik et al., 2023). In this study, the following analyses were conducted:

1. *Descriptive bibliometric analyses:* Annual publication trends, distribution of publications by country, institution, journal, funding agency, and author were examined using frequency counts.

2. *Citation analysis:* Total citations, average citations per article, and the h-index of the publication set were calculated based on Web of Science citation data.

3. *Keyword co-occurrence network analysis:* A keyword co-occurrence map was generated using VOSviewer. The association strength normalization method was applied with a minimum keyword occurrence threshold of three. Of the 367 total keywords identified, 30 met the threshold and were included in the network visualization.

4. *Co-authorship network analysis:* Author-level and country-level co-authorship networks were analyzed to identify collaborative patterns among researchers and institutions.

It should be noted that while VOSviewer also supports co-citation and bibliographic coupling analyses, these were not conducted in the present study due to the relatively small sample size (n = 112), which limits the statistical robustness of such network analyses. This is acknowledged as a methodological limitation.

Ethical Considerations

As this study did not involve human participants and was based on document analysis, ethical approval was not required.

Results

Distribution of Studies by Year

Of the 112 publications included in the study, 108 were original articles and 4 were review articles. The annual number of publications ranged from 4 to 18, with the highest number recorded in 2020 (n = 18) and the lowest in 2014 (n = 4). A general upward trend in publication output was observed from 2019 onward, with a notable peak in 2020, followed by a slight decline in subsequent years. The yearly distribution of articles is presented in Figure 2.

Figure 2. Annual distribution of publications on diabetes in nursing indexed in the Web of Science Core Collection between 2013 and 2023. The figure illustrates a steady increase in publication output from 2019, reaching its peak in 2020 (n = 18), which may reflect the intensified research activity associated with the COVID-19 pandemic period.

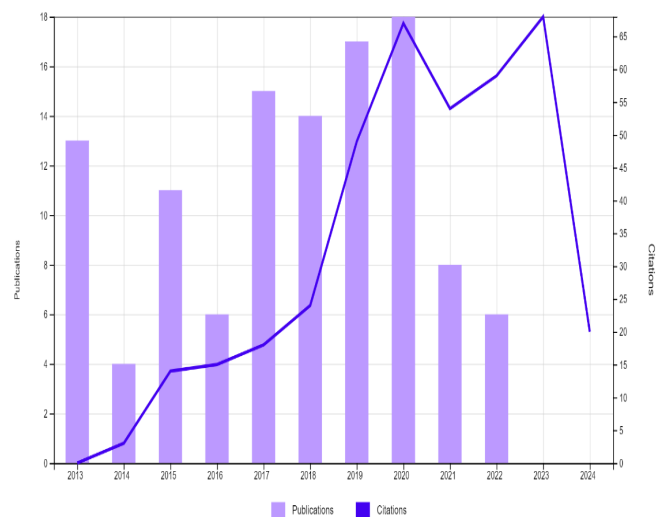


Figure 2. Number of articles published by year

Author, Country and Institutional Analysis

A total of 200 authors from 21 countries contributed to the 112 publications. The most productive authors each contributed a maximum of three publications, including Szewczyk A., Tobiasz-Kalkun N., Damgaard G., Wooton A., Stefanowicz A., Michalowska J., Kobos E. M., Kapusciock J., Franks A. T. and Jaime-Lara R. B. The relatively even distribution of productivity among the top authors suggests an absence of dominant individual contributors and points to a broadly distributed research community in this field. The top 10 countries contributing to the published articles were the United States (n = 66), Australia (n = 10), Brazil (n = 9), Canada (n = 6), Thailand (n = 4), Norway (n = 3),

Turkey (n = 3), the United Kingdom (n = 2), Indonesia (n = 2), and Iran (n = 2). In addition, 61 institutions contributed to the publications. The United States accounted for approximately 59% of all publications, indicating a strong concentration of research output in high-income, English-speaking countries. A total of 61 institutions contributed to the publications. The leading institutions were the University of North Carolina at Chapel Hill (n = 9) and Duke University (n = 4), both of which are research-intensive universities with established nursing and diabetes research programs. A total of 61 funding organizations supported the articles, with the National Institutes of Health (NIH, USA) (n = 5) and the United States Department of Health and Human Services (n = 5) being the most frequent sponsors. Full details are presented in Table 1.

Journal and Citation Analyses

The 112 studies were published across 37 journals, indicating a relatively wide distribution of publication outlets. The journal with the highest number of publications was *The Nurse Practitioner* (n = 36), accounting for approximately 32% of all included articles. Several journals published four articles each, including *Journal for Nurses in Professional Development*, *Nurse Researcher*, *Nursing Research and Practice*, *Pacific Rim International Journal of Nursing Research*, *Pielęgniarstwo XXI Wieku* (Nursing in the 21st Century), and *Revista de Pesquisa: Cuidado é Fundamental Online* (Table 1).

Regarding citation metrics, the 112 included publications collectively received 896 citations, with a total of 3,717 references generated across all studies. The average number of citations per article was 8, and the median citation count was 3, reflecting the right-skewed distribution typical of emerging research fields. The h-index of the included publication set was 10, indicating that 10 articles each received at least 10 citations.

The highest number of citations in a single year was recorded in 2020 (n = 67). To account for differences in publication age, normalized citation rates were also considered: earlier publications (2013-2015) demonstrated higher cumulative citation counts, while more recent publications (2021-2023) showed lower absolute citations but comparable annual citation rates relative to their time in the literature.

The two most highly cited articles (n = 19 citations each) were: Kaya and Karaca's "Evaluation of Nurses' Knowledge Levels of Diabetic Foot Care Management," published in *Nursing Research and Practice* (average citations per year: 2.71), and Macdonald et al.'s "Nurse-Patient Communication in Primary Care Diabetes Management: An Exploratory Study," published in *BMC Nursing* (average citations per year: 1.58). The top 15 most cited publications are presented in Table 2.

Keyword Network Analysis

The keyword co-occurrence network is illustrated in Figure 3. A total of 367 unique keywords were identified across the 112 publications; of these, 30 met the minimum occurrence threshold of three and were included in the network visualization. The network was generated using the association strength normalization method, and link strength values between keyword pairs reflect the frequency of their co-occurrence relative to their individual occurrence rates. The overall network density was low, consistent with the relatively small and specialized nature of the publication set.

The most frequently occurring keywords were "diabetes mellitus", "nursing", "type 2 diabetes mellitus", "diabetes" and "primary care", reflecting the core thematic focus of the field. The keywords were organized into six distinct clusters based on co-occurrence patterns:

Table 1. Top 10 Contributing Authors, Countries, Institutions, Funding Agencies, and Journals in the Field

Author	No. of Articles	Country	No. of Articles	Institution	No. of Articles	Funding Agency	No. of Articles	Journal	No. of Articles
Szewczyk, Alicja	3	USA*	66	University Of North Carolina	5	National Institutes of Health NIH USA	5	Nurse Practitioner	36
Tobiasz-Kalkun, Natasza	3	Australia	10	Duke University	4	United States Department of Health Human Services	5	Journal For Nurses in Professional Development	4
Damgaard, Gloria	3	Brazil	9	University of North Carolina Chapel Hill	4	Eli Lilly	2	Nurse Researcher	4
Wooton, Angela	3	Canada	6	Mahidol University	3	NIH National Institute of Nursing Research (NINR)	2	Nursing Research and Practice	4
Stefanowicz, Anna	3	Thailand	4	South Dakota Board of Nursing	3	Rockefeller University Heilbrunn Nurse Scholar Award	2	Pacific Rim International Journal of Nursing Research	4
Michalowski, Jolanta	3	Norway	3	University of Southern Indiana	3	Abbott Laboratories	1	Pielęgniarstwo XXI Wieku (Nursing in the 21st Century)	4
Kobos, Ewa Małgorzata	3	Türkiye	3	University of Virginia	3	American Cancer Society	1	Revista de Pesquisa Cuidado e Fundamental Online	4
Kapusciok, Justyna	3	United Kingdom	2	University System of Ohio	3	AstraZeneca	1	Biological Research for Nursing	3
Franks, Alexis T.	2	Indonesia	2	Vanderbilt University	3	BIPI	1	BMC Nursing	3
Jaime-Lara, Rosario B	2	Iran	2	Isfahan University of Medical Sciences	2	Boehringer Ingelheim	1	Canadian Journal of Nursing Research	3

*USA: The United States of America; NIH: National Institutes of Health

Analysis of Publications by Web of Science Index

The included publications were identified in two Web of Science indices: the Emerging Sources Citation Index (ESCI) (n = 109; 97.3%) and the Science Citation Index Expanded (SCI-E) (n = 3; 2.7%). No publications indexed in the Arts & Humanities Citation Index (A&HCI) were identified. The predominance of ESCI-indexed publications suggests that diabetes-related nursing research is largely published in emerging or developing journals that are gaining international recognition but have not yet achieved full SCI-E indexing. The distribution of publications by Web of Science index is presented in Table 3.

Table 3. Distribution of Publications by Web of Science Index

Web of Science	No. of Publications (n)	Percentage of 112 Articles (%)
Emerging Sources Citation Index	109	97.321%
Science Citation Index Expanded	3	2.679%

Data Transparency Statement

All bibliometric data used in this study were retrieved from the publicly accessible Web of Science Core Collection database. The dataset supporting the findings of this study is available from the corresponding author upon reasonable request. Network visualization files generated using VOSviewer are also available upon request. No personally identifiable data were used, and all analyses were conducted on publicly available publication metadata.

Discussion

This study provides a comprehensive bibliometric overview of diabetes-related nursing research published between 2013 and 2023, identifying publication trends, influential authors, leading countries and institutions, prominent journals, citation patterns, and thematic clusters through keyword co-occurrence analysis. Beyond descriptive reporting, the findings offer analytical insights into the intellectual structure and evolving priorities of this research domain, contributing a structured evidence base to guide future nursing scholarship in diabetes care.

Publication Trends and Contributing Factors

The analyses revealed a general upward trend in publication output from 2019 onward, peaking in 2020 (n = 18). While the temporal coincidence with the COVID-19 pandemic is notable, attributing this increase solely to the pandemic would imply a causal relationship that the available bibliometric data cannot substantiate. A more balanced interpretation recognizes that multiple converging factors likely contributed to this growth. First, the overall expansion of the nursing research field globally, reflected in the growing number of nursing journals indexed in international databases, may have increased publication opportunities. Second, the pandemic period catalyzed widespread adoption of telehealth and digital health models in diabetes care, generating a new wave of research questions that nurses were well-positioned to address (Dat et al., 2024; Eberle & Stichling, 2021). Third, increased research funding directed toward chronic disease management during the pandemic, particularly from agencies such as the NIH and HHS, may have supported a higher volume of nursing studies. Fourth, the growing global recognition of diabetes as a public health priority, with diabetes now among the top ten causes of death worldwide (WHO, 2023), has sustained long-term research interest independent of the pandemic.

Taken together, the 2020 peak likely reflects a confluence of structural, epidemiological, and contextual factors rather than a single cause.

Country, Institutional, and Funding Patterns

The United States accounted for approximately 59% of all publications, a dominance that warrants analytical interpretation beyond simple enumeration. This concentration reflects several structural advantages: the United States hosts a large number of research-intensive universities with dedicated nursing schools, benefits from substantial federal funding for health research through the NIH and HHS, and operates within a publication culture that strongly incentivizes academic output. Furthermore, the restriction of this study to English-language publications indexed in the Web of Science Core Collection inherently favors countries where English is the primary language of scientific communication, which may have amplified the apparent dominance of the United States and other anglophone countries such as Australia, Canada, and the United Kingdom. The presence of Brazil, Thailand, and Norway among the top ten contributing countries is noteworthy and suggests that diabetes nursing research is gaining traction in diverse global contexts, though these countries remain underrepresented relative to their diabetes burden.

At the institutional level, the University of North Carolina at Chapel Hill and Duke University emerged as the leading contributors. Both institutions are recognized centers of excellence in nursing and health sciences research, with strong infrastructural support, interdisciplinary collaboration networks, and established pipelines for funded research. The predominance of university-affiliated institutions among the top ten contributors underscores the academic rather than clinical orientation of the existing literature, pointing to a potential gap between research production and practice-based knowledge generation.

Journal Distribution and Citation Analysis

The concentration of approximately 32% of all publications in a single journal "The Nurse Practitioner" raises questions about the breadth of the dissemination landscape. While this journal holds a prominent position in advanced practice nursing, the heavy concentration of publications in one outlet may limit the interdisciplinary reach of diabetes nursing research. The most highly cited journals, however, were "Nursing Research and Practice" and "BMC Nursing", both of which publish open-access content, suggesting that accessibility may play an important role in citation impact within this field.

The two most highly cited studies, Kaya and Karaca (2018) and Macdonald et al. (2013), each received 19 citations, and their influence merits deeper examination. Kaya and Karaca's study on nurses' knowledge of diabetic foot care management addressed a clinically critical topic, diabetic foot complications remain a leading cause of amputation globally and provided actionable, practice-relevant findings that likely enhanced its uptake by both researchers and clinicians. Macdonald et al.'s study on nurse-patient communication in primary care diabetes management tackled the relational and communicative dimensions of care, an area that has gained increasing recognition as central to patient adherence and self-management outcomes. Both studies employed methodologies, a descriptive survey and a qualitative exploratory design, respectively that are accessible and replicable, which may have further contributed to their citation frequency. More broadly, the predominance of descriptive, cross-sectional, and qualitative studies

among the most cited works reflects the current methodological landscape of nursing diabetes research, which, while valuable for generating understanding, lacks the causal and interventional evidence needed to guide practice changes at scale.

Keyword Co-occurrence and Thematic Structure

The keyword co-occurrence network revealed six thematic clusters, providing insight into the intellectual organization of diabetes nursing research. The close proximity of Cluster 1 (general diabetes nursing care) and Cluster 2 (type 2 diabetes and nursing practice) in the network map indicates a strong conceptual overlap, reflecting the dominant focus of the field on type 2 diabetes management in clinical nursing contexts. This finding is consistent with the global epidemiological reality, as type 2 diabetes accounts for approximately 90–95% of all diabetes cases (IDF, 2025).

Cluster 3, centered on primary care and nurse practitioners, represents an important and growing area of practice, particularly as healthcare systems increasingly rely on advanced practice nurses to manage chronic conditions in community settings. The relatively peripheral position of Cluster 4 (self-care, cardiovascular disease, type 1 diabetes, children) and Cluster 5 (obesity, hypoglycemia, insulin) in the network suggests that pediatric diabetes nursing, comorbidity management, and pharmacological dimensions of care remain underexplored research areas. Similarly, Cluster 6 (qualitative research) appearing as a small, peripheral cluster indicates that methodological diversity, particularly qualitative and mixed-methods approaches has not yet been fully integrated into the mainstream of diabetes nursing research. These gaps represent meaningful directions for future scholarly attention.

The low overall network density observed in this analysis is consistent with a field that, while growing, has not yet achieved the degree of thematic integration and cross-cluster collaboration characteristic of more mature research domains. This finding suggests that diabetes nursing research would benefit from greater interdisciplinary collaboration and the development of shared conceptual frameworks.

Originality and Contribution to the Field

To the best of our knowledge, this is the first bibliometric study to systematically map the intellectual landscape of diabetes-related nursing research using VOSviewer-based network analysis across a defined ten-year period. While previous bibliometric studies have examined diabetes research broadly or nursing research in general, none have specifically focused on the intersection of these two domains with this level of methodological detail. The present study contributes to the literature by identifying not only descriptive patterns but also structural features of the research network, including thematic clustering, publication concentration, and citation dynamics that have practical implications for research planning, funding prioritization, and journal policy in nursing and diabetes care.

Conclusion and Recommendations

This bibliometric analysis provides a structured overview of diabetes-related nursing research published between 2013 and 2023, offering insights into the intellectual landscape, thematic priorities, and collaborative patterns that have shaped this field over the past decade. However, given that the study was restricted to the Web of Science Core Collection and limited to English-language publications, the findings should be interpreted as a partial and preliminary

representation of the field rather than a comprehensive account of the global diabetes nursing literature. Research published in other languages or indexed exclusively in databases such as Scopus, PubMed, or CINAHL was not captured, which may have influenced the observed distributions of publications across countries, institutions, and thematic areas.

Within these boundaries, the analysis reveals that diabetes-related nursing research has grown steadily over the study period, with a notable peak in 2020 likely reflecting a confluence of factors including the COVID-19 pandemic, the global expansion of nursing research, and increased recognition of diabetes as a public health priority. The United States emerged as the dominant contributor to the literature, supported by well-established research infrastructure and substantial federal funding, though the presence of countries such as Brazil, Thailand, and Norway among the top contributors suggests that interest in this field is gradually becoming more globally distributed.

Thematically, the field has been concentrated primarily on type 2 diabetes management and primary care nursing, with comparatively limited attention to pediatric diabetes, comorbidity management, pharmacological dimensions of care, and methodological diversity. The most frequently cited studies addressed clinically actionable topics, nurses' knowledge of diabetic foot care and nurse-patient communication in diabetes management, underscoring the field's orientation toward practice-relevant knowledge. The predominance of descriptive, cross-sectional, and qualitative designs across the included studies reflects a maturing but still developing evidence base, one that has laid important groundwork but has yet to establish a robust body of longitudinal and interventional research.

Based on these findings, several directions are proposed for advancing diabetes-related nursing research. Future studies should prioritize longitudinal, experimental, and intervention-based designs capable of establishing causal relationships and evaluating the effectiveness of nursing-led strategies in diabetes prevention, self-management support, and patient education. Given the accelerated adoption of digital health tools and telehealth models, particularly during and following the COVID-19 pandemic, research evaluating the impact of nurse-led remote care interventions represents a pressing and underexplored priority. Furthermore, since diabetes prevalence is disproportionately high in low- and middle-income countries, future research should more deliberately address culturally sensitive nursing interventions, the social determinants of health, and structural barriers to care access among diverse and vulnerable populations. Expanding bibliometric analyses to include multiple databases and broader search strategies would also strengthen future efforts to map this field comprehensively.

Limitations

This study has several important limitations. First and foremost, the literature search was restricted to the Web of Science Core Collection database. Consequently, studies on nursing and diabetes published in journals not indexed by Web of Science could not be included in the bibliometric analysis, thereby limiting the extent to which the findings reflect the relevant literature. The inclusion of additional databases such as Scopus, PubMed or CINAHL could have yielded more comprehensive and representative results.

Second, the search strategy was limited to only the keywords "diabetes" and "nursing". The omission of alternative and related terms such as "diabetic care", "nurse practitioner", "glycemic control", "diabetes education", "diabetes management",

“insulin therapy” and “diabetes self-management” from the search strategy may have resulted in a considerable number of relevant studies being excluded from the scope of the analysis. This narrows the breadth of findings regarding research patterns and trends in diabetes nursing.

Third, this study encompasses only English-language publications classified as “articles” or “reviews” published between 2013 and 2023. Book chapters, conference proceedings, case reports, and letters to the editor were excluded. The exclusion of non-English publications may have overlooked contributions from countries with a strong tradition of publishing in languages other than English, such as Turkey, Brazil, and several Asian nations. This may have contributed to the apparent dominance of the United States in publication output and understated the actual volume of diabetes nursing research conducted globally.

Fourth, the restriction of the study to descriptive bibliometric indicators, without conducting co-citation or bibliographic coupling analyses, limits the ability to reveal deeper intellectual relationships among research streams, authors, and institutions. As a result, the thematic clusters identified through keyword co-occurrence analysis may not fully capture the underlying conceptual structure of the field. The relatively small sample size ($n = 112$) further constrained the statistical robustness of network-based analyses, which may have reduced the reliability of observed collaboration patterns among authors and countries.

Collectively, these limitations suggest that the findings of this study should be interpreted as a preliminary and partial mapping of diabetes-related nursing research rather than a definitive or exhaustive representation of the field. Future bibliometric studies incorporating multiple databases, broader search strategies, and advanced network analyses would be needed to provide a more complete picture.

What did this study add to the literature?

- In essence, this study provides a structured, quantitative overview of diabetes-related nursing research, enabling researchers, practitioners, and policymakers to better understand the current state of knowledge and identify priorities for future work.
- It further reveals methodological patterns, predominantly descriptive, cross-sectional, and qualitative and signals a need for more longitudinal and intervention-based research and broader international collaboration to strengthen evidence-based nursing practice in diabetes care.

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Author Contributions: The author confirms sole responsibility for the conception, design, data collection, analysis, interpretation, writing, and critical review of the manuscript.

Ethics Approval: Not applicable.

Informed Consent: Not applicable.

Data Sharing Statement: The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

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