Mehmet Akif Ersoy Üniversitesi

Sağlık Bilimleri Enstitüsü Dergisi

SBE

SAĞLIK BİLİMLERİ ENSTİTÜSÜ

NİSAN/APRIL 2022
CİLT/VOLUME 10
SAYI/ISSUE 1

Mehmet Akif Ersoy University

Journal of Health Sciences Institute

E-ISSN: 2148-2837

ISSN: 2148-2837

MEHMET AKİF ERSOY ÜNİVERSİTESİ SAĞLIK BİLİMLERİ ENSTİTÜSÜ DERGİSİ

Mehmet Akif Ersoy University Journal of Health Sciences Institute

İletişim Adresi / Correspondence Address: Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Müdürlüğü MAKÜ Sağlık Bilimleri Enstitüsü Dergisi Sekreterliği 15030 - BURDUR
Telefon: +90 248 2133181 **Faks:** +90 248 2133190 **E-posta:** sagbild@mehmetakif.edu.tr
Web Adresi: http://dergipark.ulakbim.gov.tr/maeusabed/

Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi yılda 3 sayı olarak yayımlanır (Aralık-2019 itibariyle). Dergi, *DOAJ, Google Scholar, SciLib, Researchbib, SOBIAD, Türkiye Atıf Dizini* gibi ulusal ve uluslararası indeksler tarafından taranmaktadır.

Yıl/Year: 2022 – Cilt/Volume:10 – Sayı/Issue: 1

Yayın Kurulu / Advisory Board

Editör Kurulu / Editorial Board

Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi
YAZARLARA BİLGİ

I- Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi Genel Bilgiler

Mehmet Akif Ersoy Üniversitesi (MAKÜ) Sağlık Bilimleri Enstitüsü Dergisi, Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü'nün yayın organıdır. Derginin kısaltılmış adı "MAKÜ Sag. Bil. Enst. Derg" dir. Yılda 2 kez yayınlanır. MAKÜ Sağlık Bilimleri Enstitüsü Dergisi sağlık bilimleri, (veteriner, tıp, diş hekimliği, hemşirelik ve spor bilimleri) alanlarında temel ve klinik hakemli bilim yazılarının yayınlandığı hakem-denetimli bir dergidir. Derginin dili İngilizce'dir. Dergiye gönderilen yazıların başka herhangi bir dergide yayınlanmamış, yayına kabul edilmemiş ya da yayınlanmak üzere değerlendirme aşamasında olmaması gerekir. Bu kural bilimsel toplantılarda sunulan ve özeti yayınlanan bildiriler için geçerli değildir. Ancak, bu gibi durumlarda bildirinin sunulduğu toplantının adı, tarihi ve yeri bildirilmelidir. Makalelerin formatı "Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication (http:/www.icmje.org/)" kurallarına göre düzenlenmelidir.

Gönderilen yazılar yayın kuruluna ulaştıktan sonra öncelikle, yazım kurallarına uygunluğu yönünden değerlendirilir; sonucu yazara dört hafta içinde bildirilir. Yazının, gerek teknik özellikleri gerekse genel kapsamı açısından derginin genel yayın ilkelerine uygun bulunmaması durumunda yazı reddedilir. Ya da, gerekirse, yazar(lar)ın yazıyı yazım kurallarına uygun biçimde yeniden göndermeleri istenebilir. Yeniden gönderilen yazılar benzer bir teknik incelemenin ardından yazım kurallarına uygun ise danışman denetimi sürecine alınır. Yazı, editör ve yardımcı editörler ile yazının başlık sayfasını görmeyen en az iki danışmana gönderilerek incelenir. Yazı, yayın kurulunun belirlediği ve bilimsel içerik ve yazım kuralları açısından değerlendirilir. Editör ve yardımcı editörler gerek gördüğünde makaleyi üçüncü bir danışmana gönderebilir. Hakem belirleme yetkisi tamamen editör ve yardımcı editörler ve yayın kuruluna aittir. Danışmanlar belirlenirken derginin uluslararası yayın danışma kurulundan isimler seçilebileceği gibi yazının konusuna göre ihtiyaç duyulduğunda yurt içinden veya yurt dışından bağımsız danışmanlar da belirlenebilir. Daha sonra, danışman raporları dikkate alınarak ve gerekirse yazar(lar)la tekrar iletişim kurularak yayın kurulunca son redaksiyon yapılır. Yazıların kabulüne editör karar verir.

Editör yayın koşullarına uymayan yazıları; düzeltmek üzere yazarına geri gönderme, biçimce düzenleme veya reddetme yetkisine sahiptir. Yazılarını geri çekmek isteyen yazarlar bunu yazılı olarak editöre bildirmek durumundadır. Editör görülen lüzum halinde bazı makaleler hakkında yayın yürütme kurulunun görüşüne başvurur. Bu değerlendirme süreci dergiye gönderilen yazı türlerinden araştırma yazılarını, olgu sunumlarını ve özgün yazıları kapsar. Diğer yazı türlerindeki yazılar doğrudan yayın kurulunca değerlendirilir. Dergiye gönderilen yazılar yayınlansın ya da yayınlanmasın geri gönderilmez. Tüm yazarlar bilimsel katkı ve sorumluluklarını ve çıkar çatışması olmadığını bildiren toplu imza ile yayına katılmalıdır. Araştırmalara yapılan kısmi de olsa nakdi ya da ayni yardımların hangi kurum, kuruluş, ilaç-gereç firmalarınca yapıldığı dip not olarak bildirilmelidir. Dergide yayınlanan yazılar için herhangi bir ücret ya da karşılık ödenmez.

Yayın kurulu yazar(lar)ın dergiye gönderdikleri yazıları değerlendirme süreci tamamlanmadan başka bir dergiye göndermeyeceklerini taahhüt ettiklerini kabul eder. İnsanlar ve hayvanlar üzerinde yapılan deneysel araştırmaların bildirildiği yazıların gereç ve yöntem bölümünde, bu araştırmanın yapıldığı gönüllü ya da hastalara uygulanan işlemler anlatıldıktan sonra kendilerinin onaylarının alındığını (informed consent) gösterir bir cümle bulunmalıdır. Yazar(lar), bu tür araştırmalarda, uluslararası alanda kabul edilen kılavuzlara (2002 yılında revize edilen 1975 Helsinki Deklarasyonu- http://www.wma.net/e/policy/b3.htm, Guide for the care and use of laboratory animals - www.nap.edu/catalog/5140.html), T.C. Sağlık Bakanlığı tarafından getirilen, 29 Ocak 1993 tarih ve 21480 sayılı Resmi gazetede yayınlanan "İlaç Araştırmaları Hakkında Yönetmelik" ve daha sonra yayınlanan diğer yönetmeliklerde belirtilen hükümlere uyulduğunu belirtmeli ve kurumdan aldıkları Etik Kurul Onayı'nın bir kopyasını göndermelidir. Metin içinde standart kısaltmalar kullanılır, bunlar ilk geçtikleri yerde açık olarak yazılır. İlaç adları kullanımında ilaçların jenerik adları Türkçe okunuşlarıyla yazılır. Ölçüm birimleri metrik sisteme uygun

olarak verilir; örneğin, "mg" olarak yazılır, nokta kullanılmaz; ek alırsa („) ile ayrılır. Laboratuar ölçümleri Uluslararası Sistem (US; Systéme International: SI) birimleri ile bildirilir.

Bilimsel sorumluluk

Makalelerin tüm bilimsel sorumluluğu yazarlara aittir. Gönderilen makalede belirtilen yazarların çalışmaya belirli bir oranda katkısının olması gereklidir. Yazarların isim sıralaması ortak verilen bir karar olmalıdır. Sorumlu yazar, yazar sıralamasını "Yazar Sorumluluk ve Yayım Hakkı Devir Formu'nu" doldurarak tüm yazarlar adına kabul etmiş sayılır. Yazarların tümünün ismi makale başlığının altındaki bölümde yer almalıdır.

Yayın Ücretleri

Bu dergide yayın tamamen ücretsizdir. Yayın ücreti, başvuru ücreti, makale işleme ücreti ve bir figürün, rakamın veya tamamlayıcı verinin uzunluğuna göre ek ücret ödenmesi gerekmez. İçerik öğeleri (Editörler, Düzeltmeler, İlaveler, Geri Çekmeler, Mektuplar, Yorumlar vb.) tamamen ücretsizdir.

Etik sorumluluk

Makalelerin etik kurallara uygunluğu yazarların sorumluluğundadır. Hayvanlar üzerinde yapılan deneysel çalışmalarda, çalışma protokolünün çalışmanın yapıldığı kurumdaki hayvan deneyleri etik kurulu tarafından onaylandığı belirtilmelidir. Yazarlar etik kurul onayını makale ile birlikte göndermelidir. Eğer makalede daha önce yayımlanmış alıntı yazı, tablo, resim vs. var ise yazarlar; yayım hakkı sahibi ve yazarlarından yazılı izin alarak bu durumu makalede belirtmek zorundadır. Makalenin değerlendirilmesi aşamasında yayın kurulunun gerek görmesi halinde, makale ile ilgili araştırma verilerinin ve/veya etik kurul onayı belgesinin sunulması yazarlardan talep edilebilir.

İntihal politikası

Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi'ne (MAKÜ Sag. Bil. Enst. Derg.) Gönderilen yazılar intihal açısından değerlendirilir. Her gönderilen makale, iThenticate ve Turnitin yazılımı ile intihal için kontrol edilir. Makalenin benzerlik oranı %20'nin üzerinde ise, revize edilmesi için ilgili yazara geri gönderilir. Eğer makalenin yayınlanmasından sonra intihal kanıtlanırsa, bu makale derhal web sitesinden kaldırılır ve ilgili yazarlara makalelerinin MAKÜ Sag. Bil. Enst. Derg.'de yayınlanmasının uygun olmadığı bildirilecektir.

II- Dergiye Gönderilecek Yazı Türleri ve Özellikleri

a) Araştırma Makaleleri: Bu yazılar daha önce yayınlanmamış özgün araştırma verilerinin değerlendirildiği net anlam taşıyan bilimsel çalışmaları kapsar. Araştırma makaleleri "Öz, Giriş, Gereç ve Yöntem, Bulgular, Tartışma ve Kaynaklar" bölümlerinden oluşmalıdır. Dergide yayınlanmak üzere gönderilen araştırma makaleleri kapak sayfası hariç en fazla 20 sayfa olmalıdır. Araştırma makalelerinde kullanılacak tablo, çizim ve resim sayısı toplam 10'u geçmemelidir. Yazarlar gerek duydukları takdirde "Tartışma" bölümünden sonra "Teşekkür" bölümü açarak gerekli açıklamaları yapabilirler.

b) Derleme Makaleleri: Derleme makaleleri dergi editör/yayın kurulu tarafından "çağrılı derlemeler" başlığı altında oluşturulan alnında katkı sağlama potansiyeli olan yazıları içerir. Kaynakça bölümü en fazla 30 kaynakçadan oluşturulmalıdır. Derlemelerde kullanılacak tablo, çizim ve resim sayısı toplam 10'u geçmemelidir. Kapak sayfası hariç en fazla 20 sayfa olarak hazırlanmalıdır. Derlemelerde mutlaka "Öz, Giriş, Sonuç ve Kaynaklar" bölümleri bulunmalıdır.

c) Olgu Sunumları: Yazarların, herhangi planlanmış bir araştırmaya dayanmayan ancak karşılaştıkları yeni veya ender gözlemlenen olguların ele alındığı, bilimsel değere sahip bilgileri içeren eserlerdir. Bu eserlerde gereksiz

uzatmaları önlemek amacıyla en fazla 15 kaynak kullanılmalı ve bu kaynakların güncel olmasına özen gösterilmelidir. Kapak sayfası hariç en fazla 5 sayfa olmalı; "Öz, Giriş, Olgu, Tartışma ve Kaynaklar" bölümlerinden oluşmalıdır.

d) Kısa Araştırma Raporu: Dar kapsamlı ele alınmış (sınırlı sayıda örneğin analiz edildiği çalışmalar vb.) ancak önemli ve yeni bilgiler sunan bilimsel araştırmaya dayalı makalelerdir. Kısa bildiriler araştırma makalesi formatında hazırlanmalı ve kapak sayfası hariç en fazla 10 sayfa olmalıdır. Bu eserlerde kullanılacak tablo ve şekil sayısı beşi geçmemelidir.

e) Özel Bölümler:

1. Editöre mektuplar: Dergide yayınlanan yazılara ilişkin değerlendirme ve eleştirileri içeren yazılardır. Mümkün olduğunca eleştirilen yazının yazar(lar)ınca verilen yanıtlar ile birlikte yayınlanır. Editöre mektuplar 3 sayfayı geçemez.

2. Toplantı haberleri/izlenimleri: Derginin yayın alanıyla ilgili konularda yapılmış ya da yapılacak olan bilimsel toplantıları tanıtıcı yazılardır. 1 sayfayı geçemez.

3. Dergi haberleri: Derginin yayın alanıyla ilgili konularda yayınlanmakta olan bilimsel dergileri tanıtıcı yazılardır; 1 sayfayı geçemez.

4. Web siteleri tanıtımı: Derginin yayın alanıyla ilgili konulardaki web sitelerini tanıtıcı yazılardır; 1 sayfayı geçemez.

5. Kitap/tez tanıtımı: Derginin yayın alanıyla ilgili konularda yayınlanmış bulunan kitapları/tezleri tanıtan yazılardır; 3 sayfayı geçemez.

III- Makalelerin Düzenlenmesi

Dergiye gönderilecek yazılar türlerine göre, başlık sayfası, İngilizce ve Türkçe özetler, ana metin, kaynaklar, tablo/şekil/resim bölümlerini içerir. Dergiye yayınlanması için gönderilen makalelerde aşağıdaki biçimsel esaslara uyulmalıdır: Yazı Microsoft Word programında Times New Roman yazı stilinde 12 punto büyüklüğünde, siyah renkte, 1,5 satır aralığında hazırlanmalıdır. Kenarlardan 2,5 cm boşluk bırakılmalıdır. Her sayfaya satır numarası eklenmelidir.

Anatomik terimler Latincede yazıldığı gibi kullanılmalıdır. Günlük tıp diline yerleşmiş terimler ise okundukları gibi Türkçe yazım kurallarına uygun olarak yazılmalıdır. İngilizce veya başka bir yabancı dildeki şekli ile yazılan terimler tırnak içinde belirtilmelidir. Yazının başlık sayfasında, yazının Türkçe ve İngilizce başlığı ve sayfa üstünde kullanılmak üzere boşluklar da dahil 40 karakteri aşmayacak şekilde Türkçe ve İngilizce kısa başlık önerisi bulunmalı. Çalışmaların yapıldığı klinik, anabilim dalı/bilim dalı, enstitü ve kuruluşun adı belirtilmelidir.

a) Başlık Sayfası: Gönderilen makalenin kategorisini, başlığını (Türkçe-İngilizce ve sadece ilk sözcüğün baş harfi büyük), yazarların adlarını (sadece baş harfleri büyük yazılır), çalıştıkları kurumları (rakamla dipnot olarak belirtilmeli), yazışmaların yapılacağı sorumlu yazarın adı, açık adresi, telefon ve faks numaraları ile e-posta adresini içermelidir. Sorumlu yazar yıldız (*) ile belirtilir. Makale daha önce bilimsel bir toplantıda sunulmuş ise toplantının adı, tarihi ve yeri belirtilerek yazılmalıdır.

b) Ana Metin Bölümü: Yazının ana metni Öz ve Anahtar Kelimeler, Giriş, Gereç ve Yöntem, Bulgular ve Tartışma başlıkları içinde düzenlenir. Özler ve anahtar sözcükler: Türkçe ve İngilizce olmak üzere iki dilde yazılır ve yazının başlığını da içerir.

Öz 200 kelimeyi geçmemeli, çalışmanın ana noktaları olan amacını, hayvan ve örnek popülasyonunu, metodunu ve önemli sonuçlarını, çalışmadan elde edilen çıkarımı klinik olarak uygulanabilirliğini içermelidir. Yayını okumadan okuyucular için anlaşılır olmalıdır ve özet içinde kaynaklara atıf yapılmamalıdır. Türkçe ve İngilizce özetler ayrı sayfalarda yazılmalı ve özetlerin sonunda her iki dilden en az 3, en çok 5 anahtar sözcük yer almalıdır. Anahtar kelimeler Index Medicus Medical Subject Headings (MeSH)'e uygun olmalıdır. Anahtar kelimeler için www.nlm.nih.gov/mesh/MBrowser.html adresine başvurulmalıdır.

Giriş bölümünde yazının dayandığı temel bilgilere ve gerekçelere kısaca değinildikten sonra, son paragrafında amaç açık bir anlatımla yer alır. Gereç ve yöntem bölümü gerekirse araştırma/hasta/denek grubu, araçlar, uygulama ve istatistik değerlendirme gibi alt başlıklara göre düzenlenebilir. Bu bölüm çalışmaya katılmayan birisinin de rahatlıkla anlayabileceği açıklıkta yazılmalıdır. Bulgular bölümü çalışmanın sonuçlarını özetler ve temel bulgular gerekirse tablo ve şekillerle desteklenir. Tartışma bölümünde çalışmanın bulguları ilgili yurt içi ve yurt dışı çalışmaların sonuçları bağlamında tartışılır; genel bir gözden geçirmeyi değil, özgün bulguların tartışılmasını içerir. Yayın sisteme yüklenirken ana metin bölümü ana dosya olarak yüklenmelidir.

c) Teşekkür: Yazarlar çalışmalarında vermek istedikleri ek bilgiler ile katkı sağlayan destekçi kurumlara ve/veya şahıslara teşekkür yazılarını bu bölümde belirtebilirler.

d) Kaynaklar: Kaynaklar listesi alfabetik sıraya göre yazılmalıdır. Sadece yayınlanmış veya yayına kabul edilmiş kaynaklar yer almalıdır. Kabul edilmiş ancak henüz yayınlanmamış kaynaklar için "baskıda" ifadesi kullanılmalıdır. Yazarlar kaynaklar listesinde bulunan bütün kaynakların metin içinde kullanılmış olduğunu kontrol etmelidirler.

Yayındaki bütün kaynaklar kullanılmalıdır. Makale içinde referans kullanma şekline örnekler.

Metin içinde doğrudan atıf yapılırken yazar veya yazarların soyadından sonra parantez içinde kaynağın yayın yılı belirtilmelidir.

Örnekler: Bell (2005) tarafından; Nielsen ve Engberg (2006) tarafından; Doyle ve ark. (2007) tarafından

Cümlenin sonunda atıf yapıldığında ise yazar ismi ve yayın yılı parantez içinde belirtilmelidir.

Örnekler: ...bildirilmiştir (Bell, 2005); ....bildirilmiştir (Nielsen ve Engberg, 2006); .....bildirilmiştir (Doyle ve ark., 2007).

Birden çok kaynağa atıf yapılması durumunda kronolojik sıralama yapılmalıdır.

Örnekler: ….bildirilmiştir (Bell, 2005; Nielsen ve Engberg, 2006; Doyle ve ark., 2007).

Aynı yazarın aynı yıl yayınları söz konusu ise her biri "a" harfinden başlayarak küçük harflerle işaretlenmelidir.

Örnek: …. (Bell, 2005a; Bell, 2005b; Bell, 2005c …). Atıf yapılırken aşırı kaynak kullanımından kaçınılmalıdır.

Kaynaklar listesinin düzenlenmesi:

Mendeley programı kullanan yazarlar aşağıda linki verilen dergi format stilini kullanarak çalışmalarını düzenleyebilir:
https://csl.mendeley.com/styles/529990351/makusagbilensderg

Kaynaklar listesinde yazar isimleri ve yayın yılı koyu harflerle yazılmalıdır. Kaynak listesi şu şekilde hazırlanmalıdır:

i) Kaynak makale ise

Yazarların soyadları ve adlarının ilk harfi yazılmalıdır. Devamında sırasıyla makalenin yayın yılı, makalenin adı, yayınlandığı derginin açık adı, cilt, sayı ve sayfa numaraları belirtilmelidir.

Örnekler:

Cohen, N.D., Vontur, C.A., Rakestraw, P.C., 2000. Risk factors for enterolithiasis among horses in Texas. Journal of the American Veterinary Medical Association 216, 1787-1794.

Rajmohan, S., Dodd, C.E., Waites, W.M., 2002. Enzymes from isolates of *Pseudomonas fluorescens* involved in food spoilage. Journal of Applied Microbiology 93, 205-213.

Ono, K., Yamamoto, K., 1999. Contamination of meat with *Campylobacter jejuni* in Saitama, Japan. International Journal of Food Microbiology 47, 211-219.

Yayınlanmak üzere kabul edilen ve DOI numarası bulunan, ancak henüz basılmamış makaleler için; makale künyesinin sonunda DOI numarası belirtilmelidir.

McGregor, B.A., Butler, K.L., 2014. The value of visual fleece assessment in addition to objective measurements in identifying Angora goats of greater clean mohair production. Small Ruminant Research, in press (DOI: 10.1016/j.smallrumres.2014.04.001).

ii) Kaynak kitap ise

Yazarların (veya editörün) soyadları ve adlarının ilk harfi yazılmalıdır. Devamında sırasıyla kitabın yayın yılı, adı, yayınevi veya yayınlayan kuruluş ve yayınlandığı yer belirtilmelidir. Kaynak, kitaptan bir bölüm ise bölüm yazarlarının isminden sonra sırasıyla kitabın yayın yılı, bölümün adı, editörün soy ismi ve adının ilk harfi, bölümün alındığı kitabın adı, yayınevi veya kuruluş, yayınlandığı yer, bölümün sayfa numaraları yazılmalıdır.

Örnekler:

Combs, G.F., 1992. The Vitamins: Fundamental Aspects in Nutrition and Health. Academic Press, San Diego.

Concannon, P.W., 1986. Physiology and Endocrinology of Cannine Pregnancy. In: Marrow, D.A. (Ed.), Current Therapy in Theriogenology. Philadelphia, W.B. Saunders Company, pp. 491-497.

Perkins, J.B., Pero, J., 2002. Vitamin biosynthesis. In: Sonenshein, A., Hoch, J., Losick, R. (Eds.), Bacillus subtilis and Its Closest Relatives: from Genes to Cells. ASM Press, Washington D.C., pp. 271-286.

Kramer, J.M., Gilbert, R.J., 1989. Bacillus cereus. In: Doyle, M.P. (Ed.), Foodborne Bacterial Pathogens. Marcel Dekker, New York, pp. 22-70.

iii) Kaynak bir tez ise

Tezi yazan kişinin soyadı ve adının ilk harfi koyu olarak yazılmalı, kabul edildiği yıl, tezin başlığı, tezin cinsi (yüksek lisans veya doktora), üniversitesi ve enstitüsü belirtilmelidir.

Örnek:

Bacınoğlu, S., 2002. Boğa spermasında farklı eritme süreleri ve eritme sonrasında oluşturulan soğuk şoklarının spermatolojik özelliklere etkisi. Doktora Tezi, İstanbul Üniversitesi Sağlık Bilimleri Enstitüsü, İstanbul.

iv) Kaynak internette bulunan bir web sitesi ise

Yazarların soyadları ve adının ilk harfi (Yazar adı yoksa web sitesinin veya kaynağın adı) yazılır. Daha sonra sırasıyla yılı, makalenin adı, varsa yayıncı, internet adresi ve erişim tarihi belirtilir.

Örnekler:

FDA, 2001. Effect of the use of antimicrobials in food-producing animals on pathogen load. Systematic review of the published literature. http://www.fda.gov/cvm/antimicrobial/PathRpt.pdf (Erişim 14.12.2001)

Cleveland, C.W., Peterson, D.S., Latimer, K.S., 2005. An Overview of Canine Babesiosis. Clinical Pathology. College of Veterinary Medicine, The University of Georgia: http://www.vet.uga.edu/vpp/clerk/Cleveland (Erişim 17.12.2005).

Thierry, F., 2006. Contagious equine metritis: a review. Equine Reproductive Infections: http://www.equinereproinfections.com (Erişim 07.07.2006].

FSAI, 2008. Report of the Implementation Group on Folic Acid Food Fortification to the Department of Health and Children. Food Safety Authority of Ireland: http://www.fsai.ie/assets/0/86/204/cc3c2261-7dc8-4225-bf79-9a47fbc2287b.pdf (Erişim 20.06.2008)

v) Kaynak bilimsel toplantıda sunulmuş bir bildiri ise

Yazarların soyadı ve adının baş harfinden sonra sırasıyla toplantının yılı, bildirinin başlığı, toplantının adı, toplantı yeri, bildiri kitabındaki sayfa no yazılmalıdır.

Örnekler:

Cardinali, R., Rebollar, P.G., Mugnai, C., Dal Bosco, A., Cuadrado, M., Castellini, C., 2008. Pasture availability and genotype effects in rabbits: 2. development of gastro-intestinal tract and immune function of the vermiphorm appendix. In: Proc. 9th World Rabbit Congress, Verona, Italy, 1159-1164.

Mauget, R., Legendre, X., Comizzoli, P., 1998. Assisted reproductive technology in sika deer: a program to preserve endangered deer subspecies. In: Proc. 4th Int. Deer Biology Congress, Kaspovar, 185-186.

e) Tablolar: Kullanım sırasına göre numaralandırılmalı, kısa başlıklarla ifade edilmeli ve metin içinde tablo numarası verilerek (örneğin Tablo 1) atıfta bulunulmalıdır. Tablo başlıkları tablonun üst bölümüne yazılmalıdır. Tabloda kullanılan kısaltmalar ve gerekli açıklamalar tablo altında verilmelidir.

f) Şekil ve Resimler: Metinde kullanılan fotoğraflar, grafikler ve çizimler metin içinde şekil adı ile kullanılmalıdır. Şekiller kullanım sırasına göre numaralandırmalı ve kısa başlıklarla ifade edilmeli, metin içinde şekil numarası verilerek (örneğin Şekil 1) atıfta bulunulmalıdır. Şekil başlıkları şekillerin altında yer almalıdır. Şekillerde istenilen noktaya dikkat çekmek amacıyla; üzerlerine işaret konulmalı ve başlıklardan sonra yer alacak olan şekil altı notta kullanılan işaretler belirtilerek gerekli açıklamalar yapılmalıdır.

IV- Makale Süreci (Kör hakemlik)

Makale başvurusu yalnızca online olarak http://dergipark.gov.tr/maeusabed adresi üzerinden kabul edilmektedir. Sorumlu yazar, makale ile birlikte göndereceği tüm dosyaları yukarıdaki internet adresinde bulunan yeni makale gönder ikonunu tıklayarak sisteme ekleyebilir. Yazarlar dergiye gönderi yapmadan önce kayıt olmalıdır. Kaydolduktan sonra, ana sayfadaki Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi ikonuna tıklayarak; yazım kurallarına göre düzenlenmiş bilimsel çalışmayı dergi panelindeki Makale Gönder kısmından 4 basamaklı (başlarken, yükleme, kaynaklar, önizleme&gönder) gönderi işlemini yapabilir. Gönderilen makalede ön değerlendirme aşaması sırasında yazar künyeleri, çalışmanın yapıldığı kurum, etik kurul ya da özel izin adres bilgileri gibi tanıtıcı bilgiler içermemelidir. Ön değerlendirmeden (bilimsel nitelik, dil, yazım kuralları kontrolü, İntihal kontrolü iThenticate ve Turnitin programı,) geçen bilimsel çalışmaların hakem ataması yapılır. Sorumlu yazar makalenin hangi aşamada olduğunu sistem panelindeki Süreçteki Makaleler kısmından takip edebilir. Atanan hakemlere, kör hakemlik kuralları çerçevesinde çalışmanın tam metni, şekil, tablo, grafik ve resimleri sistem üzerinden yüklenerek e-posta aracılığıyla makale değerlendirme talebi gönderilir. Hakemler e-posta aracılığıyla gönderilen linke tıklayarak talebi kabul ya da reddederler. Kabul eden hakemler, kararlarını sistem üzerinden en fazla 1 ay içinde sebeplerle birlikte yüklemelidirler. Hakemin önerdiği düzeltme var ise tekrar yazara gönderilir. İstenilen düzeltmeler 1 ay içinde tamamlanıp gönderilmediği takdirde makale otomatik olarak iptal edilecektir. Editör, makalelerin yayın değerliliği ve hakemlerin görüşlerine dayanarak yayına kabul veya red kararını verir. İstenilen düzeltmeler yapıldıktan sonra makale yazar tarafından sisteme tekrar yüklenir. Derginin gizlilik bildiriminde belirtildiği gibi, yazarların kimlik bilgileri ve e-posta adresleri hiçbir şekilde başka amaçlar için kullanılmayacaktır.

Bu dergi; bilimsel araştırmaları halka ücretsiz sunmanın bilginin küresel paylaşımını artıracağı ilkesini benimseyerek, içeriğine anında açık erişim sağlamaktadır.

Mehmet Akif Ersoy University Journal of Health Sciences Institute
INSTRUCTIONS TO AUTHORS

I- Mehmet Akif Ersoy University Journal of Health Sciences Institute General Information

Mehmet Akif Ersoy University Journal of Health Sciences Intitute (MAKU J. Health Sci. Inst.) is the publication of Mehmet Akif Ersoy University Health Sciences Institute. It is published two times annualy. The journal is a peer-reviewed scientific journal in which basic and clinical scientific articles in the field of medical sciences (veterinary, medicine, dentistry, nursing and sports sciences) are published. The language of the journal is English. Papers submitted to the journal should not have been previously published, accepted for publication or be in the process of evaluation for publication in any other journal. This rule does not apply to articles presented as bulletins in scientific meetings and whose summaries are published. In such cases, however, the name, date and place of the meeting in which the paper was presented should be notified. The format of the article should be in accordance with the rules of "Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication (http:/www.icmje.org/)".

On receipt of the paper by the Editorial Board, the paper is evaluated for compliance with the format rules and the authors are informed about the result in four weeks. In the event that the paper is not found to comply with the general publication principles of the journal from the standpoint of either technical characteristics or general scope, the paper is rejected. Alternatively, the author(s) may be asked to re-submit the paper in accordance with the writing requirements. Papers resubmitted are passed through a similar technical examination and, if found to comply with the rules, are passed on for peer review. The paper is sent, without the title, to two reviewers selected by the board, who then assess the paper for scientific content and format compliance. When necessary the Editorial Advisory Board can send the paper to third reviewers. The selection of reviewers is ultimately at the discretion of the editor, associate Editors and/or the editorial board. The appropriate reviewers can be selected from journal's international database of reviewers listing or, if needed; independent reviewers can be determined from inland or abroad. Thereafter the Editorial Advisory Board carries out the final editing, taking the reports of the reviewers into consideration, and, when necessary, communicating with the author(s).

The Editor gives the final decision about the acceptance of the manuscript. The Editorial Board is authorized to publish the paper, return it for correction, or reject it. The assessment process involves research articles, case reports and original articles submitted to the journal. Other types of articles are evaluated directly by the Board. Papers submitted to the journal will not be returned whether they are published or not. The Editor and the Editorial Board have the right to reject, to require additional revision or to revise the format of manuscripts which do not follow the rules. The authors should inform the editorial board if they decide to withdraw the manuscript. The editor may consult editorial executive board about a manuscript if (s) he deems necessary. All the authors should submit a collectively signed statement that there is no conflict of interest regarding scientific contribution or responsibility. The association, establishment, and medication-material supply firms which have given financial, even partial, or material support to the research should be mentioned in a footnote. No fee or compensation will be paid for articles published in the journal.

The Editorial Board assumes that the author(s) are obliged not to submit the paper to another journal before completion of the assessment process. In the "method" section of articles concerned with experimental research on humans or animals, a sentence showing that the informed consent of patients and volunteers has been obtained following a detailed explanation of the interventions carried out on them. In such studies, authors should clearly state the compliance with internationally accepted guidelines (1975 Helsinki declaration revised in 2002 http://www.wma.net/e/policy/b3.htm, Guide for the care and use of laboratory animals-www.nap.edu/catalog/5140.html) issued by the Republic of Turkey Ministry of Health and published in the Official Journal dated 29 January 1993 number 21480 "Regulations Concerning Drug Research", and other more recently published rules laid out in governing statutes. They should forward a copy of the Ethic Committee Approval received from the relevant institution. Standard abbreviations used in the text are written in full when first mentioned. In the use of drugs, the generic names should be written in their Turkish pronunciation spelling

form. Measurement units are given according to the metric system; e.g. written as “mg”, no punctuation is used, in the case of extensions (,,) is used as a separator. Laboratory measurements are reported in International System Units (US; Systeme Internationale; SI).

Scientific responsibility

All scientific responsibility of the articles belongs to the authors. The authors of the submitted article must have a specific contribution to the work. Authors' name ordering should be a joint decision. Corresponding author is considered to accept the author sorting by filling in "Author Responsibility and Publication Transfer Form" on behalf of all authors. All of the authors should be listed under the title of article.

Publication Fees

Publication in this journal is totally FREE. There are no publication charges, no submission charges, no article processing charges and no surcharges based on the length of an article, figures or supplementary data. Editorial items (Editorials, Corrections, Additions, Retractions, Letters, Comments, etc.) are published free of charge.

Ethical responsibility

The authors are responsible for their compliance with the ethical rules. In experimental studies on animals, it should be noted that the study protocol has been approved by the animal experiment ethics committee at the institution where the study was conducted. Authors should submit the ethics committee's approval with the article. If there are previously published text, tables, pictures, etc. in the article, the authors have to get written permission from the copyright holder and the authors should specify and indicate the used material in the manuscript. In the course of the manuscript evaluation, the authors may be requested to submit the research data and / or the ethics committee approval document if deemed necessary.

Plagiarism policy

Manuscripts submitted to Mehmet Akif Ersoy University Journal of Health Sciences Institute is evaluated in terms of plagiarism. Every submitted article is checked for plagiarism through iThenticate and Turnitin software. When Smilarity Index of the article is above %20, it is sent back to the corresponding author to revise it. If plagiarism is proved after publication of the article, that article will be immediately removed from the website and the concerned authors will be considered ineligible for publication of their articles in Mehmet Akif Ersoy University Journal of Health Sciences Institute.

II- Types and Characteristics of Papers to be Submitted to the Journal

a) Research Articles: These articles are prepared in full accordance with the writing style definitions given below, in which previously unpublished original research data are evaluated. The main text section of the research articles should include (Title, Introduction Materials and Methods, Results, Discussion and Conclusion) sections and (excluding title page, bibliography, tables/figures/pictures) should not exceed 20 pages. If some parts of the research data given in these articles have previously been discussed in another paper, this must be notified without fail when sending the paper and, in addition, reference should be made to the relevant paper within the bibliography.

b) Review Articles: Review Articles should cover subjects falling within the scope of the journal which are of active current interest. They may be submitted or invited. Invited reviews will normally be solicited by the Review's Editor, but suggestions for appropriate review topics may be sent to editor.

c) Case Reports: These are articles which present and discuss the characteristics of one or more cases which have special features and scientific importance from the clinical evaluation, observation or other standpoint. Case

presentations include the title page, summary, main text (includes introduction, case and discussion), bibliography, table/figure/picture sections; subtitles in the main text are organised according to the text content. Abstracts of the case presentations should have 150 words. The main text (excluding title page, bibliography, table/figure/picture) should not exceed 10 pages.

d) Brief Reports: These are articles in which original ideas dealing with important theoretical or practical problems related to a specific subject are presented and discussed. Original articles include a title page, summary,

main text, bibliography, table/figure/picture sections; subtitles in the main text are organised according to the text content. The main text of original articles (excluding title page, bibliography, table/figure/picture) should not exceed 10 pages.

e) Special Sections:

1. Letters to the Editor: These articles include evaluation and criticisms of articles published in the journal. These are published together with the responses of the author(s) of the paper concerned where possible. Letters to the Editor may not exceed 5 pages.

2. Meeting news/notes: These articles introduce scientific meetings held or to be held on subjects within the scope of the journal. The paper may not exceed 1 page.

3. Journal news: These articles introduce scientific journals being published within the scope of the journal. The paper may not exceed 1 page.

4. Introduction of websites: These articles introduce websites relevant to the scope of the journal. These articles may not exceed 1 page.

5. Book/Thesis Section: These articles introduce books/theses published on subjects related to the scope of the journal and may not exceed 3 pages.

III- Preparation of Manuscripts

Papers to be submitted to the journal include the sections of title page, abstract, main text, references and tables/figures/pictures. Articles submitted for publication in the journal should follow the following formal principles: The text should be prepared in Microsoft Word program in Times New Roman font style with a font size of 12 font, black and 1.5 line. All side of the paper, page margins should be as 2.5 cm. Line numbers should be added to the beginning of the page.

Anatomical terms should be used as written in Latin. Running title (not exceed 40 characters) of the manuscript should add to title page. The name of the clinic, department / science, institute and institution should be stated.

a) Title Page: should contain the category, the title (only first letter capital), the names of the authors (only the first letters capital), the institution (s) where they work (indicated with numbered footnotes), corresponding author (address, phone, fax numbers and e-mail address). Corresponding author is indicated by an asterisk (*). If the article was previously presented at a scientific meeting, the name, date and place of the meeting must be stated.

b) Main Text: The main text of the paper is organised under the subtitles of Abstract and Keywords, Introduction, Materials and Methods, Results and Discussion.

Abstract and Keywords: This is written in two languages, Turkish and English, and also includes the title of the paper. The abstract is consists of 200 words. The abstract should bring out the main points of the manuscript and should include the following information: objective, the animals or sample population involved, design, the materials and methods used, the main results, a brief conclusion and clinical relevance, where applicable. They

should be comprehensible to readers before they have read the paper, and abbreviations and reference citations should be avoided. At the end of the abstract, at least 3, at most 5 keywords in both languages are included.

In the introduction, following a brief statement of basic information and justifications which constitute the basis of the paper, the objective is clearly given in the last paragraph. If necessary, the "method" section may be organised according to sub-titles such as research/patient/ test group, instruments, application and statistical analysis. This section should be written with clarity so that a person not involved in the study may easily understand. Results summarize the findings of the study and, when necessary, basic findings are supported with tables and figures. In the discussion section, the findings of the study are discussed in the light of relevant national and international studies; this section includes discussion of original findings, not a general review.

c) Acknowledgements: When considered necessary, author(s) may add brief acknowledgements in a few sentences to those whose contributions to the paper are not at author level but deserve to be mentioned. Here, the contributions of those acknowledged (e.g. financial or equipment aid, technical support etc) are clearly stated (e.g. "scientific counseling", "editing of the draft", "data collection", "participation in clinical research" etc).

d) Bibliographic References:

All citations in the text should refer to: the year of publication of the reference should be indicated in parentheses after the surname of the author or authors.

Examples: Bell (2005), Nielsen and Engberg (2006), Doyle et al. (2007) were indicated that.....

The name of the author and the year of publication should be stated in parentheses at the end of the sentence.

Examples: ...were detected as 23% of the samples (Bell, 2005); ....were detected as 23% of the samples (Nielsen and Engberg, 2006); ...were detected as 23% of the samples (Doyle et al., 2007).

In case of more than one reference, references should be arranged chronologically.

Examples: ....were reported that... (Bell, 2005; Nielsen and Engberg, 2006; Doyle et al., 2007).

More than one reference from the same author(s) in the same year must be identified by the letters 'a', 'b', 'c', etc., placed after the year of publication.

Examples: (Bell, 2005a; Bell, 2005b; Bell, 2005c …)

The authors can use below formatted style link in mendeley:

http://csl.mendeley.com/styles/529990351/sagbilensderg

References should be written in alphabetical order. Reference style, the authors' names and year of publication should be written in bold. Source list should be prepared as follows:

i) Examples of journal articles:

Cohen, N.D., Vontur, C.A., Rakestraw, P.C., 2000. Risk factors for enterolithiasis among horses in Texas. Journal of the American Veterinary Medical Association 216, 1787-1794.

Rajmohan, S., Dodd, C.E., Waites, W.M., 2002. Enzymes from isolates of *Pseudomonas fluorescens* involved in food spoilage. Journal of Applied Microbiology 93, 205-213.

Ono, K., Yamamoto, K., 1999. Contamination of meat with *Campylobacter jejuni* in Saitama, Japan. International Journal of Food Microbiology 47, 211-219.

For articles that are accepted for publication and have a DOI number but not yet published; DOI number must be specified at the end of the article.

McGregor, B.A., Butler, K.L., 2014. The value of visual fleece assessment in addition to objective measurements in identifying Angora goats of greater clean mohair production. Small Ruminant Research, in press (DOI: 10.1016/j.smallrumres.2014.04.001).

ii) Books:

Combs, G.F., 1992. The Vitamins: Fundamental Aspects in Nutrition and Health. Academic Press, San Diego.

Concannon, P.W., 1986. Physiology and Endocrinology of Cannine Pregnancy. In: Marrow, D.A. (Ed.), Current Therapy in Theriogenology. Philadelphia, W.B. Saunders Company, pp. 491-497.

Perkins J.B., Pero, J., 2002. Vitamin biosynthesis. In: Sonenshein, A., Hoch, J., Losick, R. (Eds.), Bacillus subtilis and Its Closest Relatives: from Genes to Cells. ASM Press, Washington D.C., pp. 271-286.

Kramer, J.M., Gilbert, R.J., 1989. Bacillus cereus. In: Doyle, M.P. (Ed.), Foodborne Bacterial Pathogens. Marcel Dekker, New York, pp. 22-70.

iii) Thesis:

Bacınoğlu, S., 2002. Boğa spermasında farklı eritme süreleri ve eritme sonrasında oluşturulan soğuk şoklarının spermatolojik özelliklere etkisi. Doktora Tezi, İstanbul Üniversitesi Sağlık Bilimleri Enstitüsü, İstanbul.

iv) Web site or author is an institution:

FDA, 2001. Effect of the use of antimicrobials in food-producing animals on pathogen load. Systematic review of the published literature. http://www.fda.gov/cvm/antimicrobial/PathRpt.pdf (Accessed: 14.12.2001)

Cleveland, C.W., Peterson, D.S., Latimer, K.S., 2005. An Overview of Canine Babesiosis. Clinical Pathology. College of Veterinary Medicine, The University of Georgia: http://www.vet.uga.edu/vpp/clerk/Cleveland (Accessed: 17.12.2005).

Thierry, F., 2006. Contagious equine metritis: a review. Equine Reproductive Infections: http://www.equinereproinfections.com (Accessed: 07.07.2006).

FSAI, 2008. Report of the Implementation Group on Folic Acid Food Fortification to the Department of Health and Children. Food Safety Authority of Ireland:http://www.fsai.ie/assets/0/86/204/cc3c2261-7dc8-4225-bf79-9a47fbc2287b.pdf (Accessed: 20.06.2008).

v) Paper presented at a scientific meeting

Cardinali, R., Rebollar, P.G., Mugnai, C., Dal Bosco, A., Cuadrado, M., Castellini, C., 2008. Pasture availability and genotype effects in rabbits: 2. development of gastro-intestinal tract and immune function of the vermiphorm appendix. In: Proc. 9th World Rabbit Congress, Verona, Italy, 1159-1164.

Mauget, R., Legendre, X., Comizzoli, P., 1998. Assisted reproductive technology in sika deer: a program to preserve endangered deer subspecies. In: Proc. 4th Int. Deer Biology Congress, Kaspovar, 185-186.

e) Tables: Each table is printed on a separate page and numbered according to the sequence of referral within the text (Table 1). Each table has a title and, when necessary, explanations are given under the table (e.g. abbreviations given in the table). Each table should be understandable without need for referral to the text. Each table should be referred to in the text..

f) Figures and Pictures: Figures should be numbered according to the order of use and should be expressed with short titles.Figures should be numbered in the text (Figure 1). Letters, numbers and symbols within the figure should be clear and readable when downsized for printing.Each figure should be referred to in the text..

IV- Submission of Articles (Blind Peer-Review)

The article submission is only accepted online via 'http://dergipark.gov.tr/maeusabed' The Corresponding authors, all the files can be added to the system by clicking the submit new article icon at the above address. Authors must register on Dergipark system before submitting a manuscript. After signing up, clicking Mehmet Akif Ersoy University Journal of Health Sciences icons on the main page, the manuscript written according to the guide for authors is submitted in 4 steps (start, submission, reference, preview & submit). The submitted manuscript must not contain any identifying information, such as author information, institution, ethics committee or special permit address, during the preliminary evaluation phase. The manuscript that pass the preliminary evaluation (paper scientific qualification, language, conformity to Guide for author and checking plagiarism via iThenticate and Turnitin program,) are assigned to the Reviewers. The corresponding author can follow the article evaluation process from the section on the Articles in the Process. According to the blind peer-review rules, the main text, tables, graphics and pictures of the manuscript are uploaded via the system and sent to the appointed reviewers for an article evaluation request via e-mail. The reviewers accept or reject the request by clicking on the link sent via e-mail. The reviewers who accept it have to upload their decisions together with the reasons within a maximum of 1 month via the system. If the correction requested by the Reviewer is sent back to the author. If the requested corrections are not completed within 1 month, the article will be automatically canceled. After the desired corrections are made, the article is uploaded back to the system by the author. The editor makes decisions to accept or reject papers based on their opinion of the papers' publication worthiness and reviewers' comments. As stated in the privacy statement, authors' identity information and e-mail addresses will not be used for any other purpose.

MEHMET AKİF ERSOY ÜNİVERSİTESİ SAĞLIK BİLİMLERİ ENSTİTÜSÜ DERGİSİ

(Mehmet Akif Ersoy University Journal of Health Sciences Institute)

MÜRACAAT VE YAYIN HAKLARI DEVİR FORMU

(Application and Copyright Transfer Statement)

Derginin kısaltılmış adı: **"MAKÜ Sağ. Bil. Enst. Derg."** dir.

Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisinde yayınlanmak üzere göndermiş olduğumuz "……." adlı

Orijinal Araştırma / *Research Articles* ( ),
Derleme / *Review Articles* ( ),
Gözlem / *Case Reports* ( ),
Editöre Mektup / *Editorial Letter* ( ),
Diğer / *Other* ( ), (……..…….) ile ilgili olarak;

The authors confirm the fallawing statements:

1-that there has been no duplicate publication or submission elsewhere of this work

2-that all authors have read and approved the manuscript, are aware of the submission for publication and agree to be listed as co-authors.

1-Bu makalenin/derlemenin bir kısmı ya da tamamı başka bir dergide yayınlanmamıştır.

2-Bu makale/derleme yayınlanmak üzere başka bir dergiye gönderilmemiştir.

3-Makale/derleme yayınlandıktan sonra tüm hakları Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisine devredilmiştir.

4-Tüm yazarlar makaleyi okumuş ve onaylamıştır. Yayınlanmak üzere dergiye gönderildiğinden haberdardır.

5-Tümü veya bir bölümü yayınlandı ise derginizde yayınlanabilmesi için gerekli iznin alındığını garanti ederiz.

Aşağıdaki maddelerde belirtilen haklarımız saklı kalmak kaydı ile makalenin telif hakkını Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi'ne devrettiğimizi taahhüt ve imza ederiz.

a- Telif hakkı dışında kalan patent vb. bütün haklar,

b- Yazarların ders, kitap gibi çalışmalarında makaleyi ücret ödemeksizin kullanabilme hakkı,

c- Satmamak üzere kendi amaçları için makaleyi çoğaltma.

Yazarlar / Author Name (tüm yazarlar tarafından imzalanacaktır)	**İmza / Signature**	**Tarih / Date**

Yazışma adresi / Corresponding author address:		
Telefon:	**Fax:**	**E-mail:** …….@.....

(Form doldurulup imzalandıktan sonra; **"Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi Editörlüğü, 15030-BURDUR"** adresine yollayınız).

This Form should be signed by all authors OR by the corresponding (or senior) author who can vouch for all co-authors. A scanned copy of the completed Form may be submitted online. Alternatively, the completed Form may be faxed to the relevant Editor:

Burdur Mehmet Akif Ersoy Üniversitesi

Mehmet Akif Ersoy Üniversitesi
Sağlık Bilimleri Enstitüsü
Dergisi

İÇİNDEKİLER / CONTENTS

Araştırma Makaleleri / Research Articles

Olgu Sunumları / Case Reports

MAKU J. Health Sci. Inst. 2022, 10(1): 62-70.
doi: 10.24998/maeusabed.1061606

Mehmet Akif Ersoy University
Journal of Health Sciences Institute
http://dergipark.gov.tr/maeusabed

Research Article / Araştırma Makalesi

Comparison of Perceived Burden of Patients with Hearth Failure and Their Caregivers

Kalp Yetersizliği Olan Hastaların ve Bakım Verenlerinin Algıladıkları Yükün Karşılaştırılması

Canan DEMİR BARUTCU[1*], Hatice MERT[2]

[1]Burdur Mehmet Akif Ersoy University, Faculty of Health Science, Department of Internal Medicine Nursing, Burdur, Turkey
[2]Dokuz Eylül University, Faculty of Nursing, Department of Internal Medicine Nursing, İzmir, Turkey

Abstract: This study was conducted to compare the perceived burden of patients with heart failure and their caregivers. The descriptive and correlational study was conducted in the cardiology service and outpatient clinic of a university hospital. Sociodemographic characteristics form was used as data collection tools, Burden Interview was used to measure caregiver's perception of burden, and Self-Perceived Burden Scale was used to measure patients' perception of burden. The relationship between patient and caregiver burden perception was examined using Pearson correlation analysis. According to the results of the research, it was found that the burden perception of the patients was high, and the caregivers' burden of care was slightly lower than moderate. It was determined that there was a moderately significant positive correlation between the patients' self-perception of burden scale and the caregivers' mean scores of the caregiver burden scale (r=0.489 p=0.000). As the burden score perceived by the patients increases, the burden score perceived by the caregivers increases. As the burden score perceived by the patients increases, the burden score perceived by the caregivers increases. It is recommended to plan interventions to reduce the burden of patients and caregivers, and to conduct research showing the effectiveness of these interventions.

Keywords: Caregiver burden, Heart failure, Nursing, Self-perceived burden.

Öz: Bu araştırma kalp yetersizliği olan hastaların ve bakım verenlerinin algıladıkları yükün karşılaştırılması amacıyla yapılmıştır. Tanımlayıcı ve korelasyonel nitelikte olan çalışma bir üniversite hastanesinin kardiyoloji servis ve polikliniğinde yürütülmüştür. Veri toplama araçları olarak sosyodemografik özellikler formu, bakım verenlerin yük algısını ölçmek için Bakım Verme Yükü Ölçeği ve hastaların yük algısını ölçmek için Kendini Yük Olarak Algılama Ölçeği kullanılmıştır. Hasta ve bakım veren yük algısı arasındaki ilişki pearson korelasyon analizi kullanılarak incelenmiştir. Araştırma sonuçlarına göre hastaların yük algısının yüksek olduğu, bakım verenlerin bakım verme yükünün orta düzeyden biraz düşük olduğu bulunmuştur. Hastaların kendini yük olarak algılama ölçeği ile bakım verenlerin **bakım verme yükü ölçeği** puan ortalamaları arasında pozitif yönde orta düzeyde anlamlı bir ilişki olduğu saptanmıştır (r=0,489 p=0,000). Hastaların algıladığı yük puanı arttıkça bakım verenlerin algıladığı yük puanı artmaktadır. Bu durum hastaların algıladığı yük arttıkça bakım veren yük algısının arttığını göstermektedir. Hasta ve bakımverenlerin yükünü azaltmaya yönelik girişimlerin planlanması, bu girişimlerin etkinliğini gösteren araştırmalar yapılması önerilmektedir.

Anahtar Kelimeler: Bakım veren yükü, Hasta yük algısı, Hemşire, Kalp yetersizliği.

[*]Corresponding author : Canan DEMİR BARUTCU
e-mail : cdemir@mehmetakif.edu.tr
Geliş tarihi / Received : 22.01.2022
Kabul tarihi / Accepted: 09.02.2022

Introduction

Heart failure is a disease that causes poor quality of life due to conditions such as inability to meet basic requirements, changing body image, lack of self-care behaviors and daily life activities, chronic fatigue, impaired sexual function, future-related concerns (Durante et al., 2019; Wilikins et al., 2017; Savarese et al., 2017; Nieminen et al., 2015; Bidwell et al., 2015; Hwang et al., 2014). As the stages of the disease progress, patients become in need of someone else's help to meet their needs,

To cite this article: DEMİR BARUTCU C, MERT H. (2022). Comparison of Perceived Burden of Patients with Hearth Failure and their Caregivers. MAKU J. Health Sci. Inst., 10(1), 62-70.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

and the majority of patients' care is provided by family members. Especially the caregiver who has an advanced stage patient; may quit his job or reduce his working time to meet the needs of his patient, may not be able to devote time to his children/other family members or social activities, and may not even be able to carry out his own self-care activities (Özer, 2010; Williams et al., 2008; Greco et al., 2017; Vellona et al., 2019). All these reasons affect the lives of caregivers physically, psychologically, socially, economically and spiritually and create a heavy burden with intense stress (Molloy, 2005).

According to the results of the study examining the burden of caregivers of heart failure patients, it was found that the quality of life of the caregivers was low, and the emotional and physical burden caused the caregivers to experience more anxiety and depression, deteriorate their health, go to the doctor more, and use more psychotropic drugs (Özer, 2010; Williams et al., 2008; Greco et al., 2017; Vellona et al., 2019). Mclfatrick et al. (2018) conducted a study to evaluate the support needs of caregivers in heart failure, and it was found that caregivers did not receive professional support, needed support during the diagnosis, and had problems due to physical limitations and psychosocial influence. For this reason, it has emerged that interventions should be increased in order to provide social support to caregivers and the necessity of minimizing the negative impact experienced by the caregiver after the discharge of the patient (Hwang et al. 2010; Mclfatrick et al., 2018).

While working on the emotions and burdens experienced by caregivers, the caregivers' feeling of burden to their caregivers is ignored. These feelings are expressed as perceived burden and cause the caregiver to experience feelings of guilt, anxiety, and depression (Arechabala et al., 2012). The patient's perception of feeling burdened is defined as guilt, responsibility, anxiety caused by the need to depend on others due to one's illness (McPherson, 2007). This situation can be evaluated in cognitive, emotional and interpersonal dimensions. The perception of being a burden to a loved one can negatively affect the person and increase the risk of suicide. The high prevalence of depression in chronic patients is a factor for increasing these risks (Kowal et al., 2012).

The burden perceived by the patients; It has been studied in individuals with chronic diseases such as pain, chronic kidney failure, ALS, and stroke, but studies on patients with heart failure and their caregivers are quite limited. In the studies, it was found that the patients were uncomfortable with the care-receiving situation, they experienced anxiety and depression, the needs, feelings and experiences of the patients were ignored, these feelings experienced by the patients could lead to communication problems between the caregiver and the patient in the future, and this situation negatively affected the quality of care (Kowal et al. 2012; Arechabala et al. 2012).

In health problems such as heart failure, where the need for care increases, nurses have a very important role in improving patient and caregiver outcomes. It is important for nurses to determine the perceived burden of both the patient and the caregiver and to compare the burden in terms of holistic care. Based on this determination, this study was conducted to compare the burden perceived by patients with heart failure and the burden perceived by their caregivers.

Materials and Methods

Design and Sample

The study was conducted as a descriptive, correlational study to examine the perception of burden between heart failure patients and their caregivers. The research sample consists of 95 patients and 95 caregivers who applied to the cardiology service and polyclinic of Dokuz Eylül University between February 2015 and July 2015. Caregiver sampling criteria in the study; Being primarily responsible for care, being older than 18 years of age, not having communication difficulties, and voluntarily accepting to participate in the study, the patient sampling criteria were as follows: having been diagnosed with heart failure at least six months ago, not having communication difficulties, and voluntarily accepting to participate in the study. The sample exclusion criteria are for

To cite this article: DEMİR BARUTCU C, MERT H. (2022). Comparison of Perceived Burden of Patients with Hearth Failure and their Caregivers. MAKU J. Health Sci. Inst., 10(1), 62-70.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

the patient; any psychiatric illness diagnosis, for the caregiver; It was determined as having a diagnosis of any psychiatric disease and providing care for a certain fee by the caregiver.

Instruments

Sociodemographic and Medical Data Collection Form

Caregiver socio-demographic characteristics form; It consists of a total of 11 questions, including "age, gender, marital status, educational status, occupation, social security, economic status, closeness with the patient, living with the patient, duration of care and having a chronic disease". Patient socio-demographic characteristics form; It consists of a total of eight questions: "age, gender, marital status, educational status, social security, time of diagnosis, left ventricular ejection fraction (LVEF) value, and chronic disease other than heart failure".

Burden Interview

Zarit Burden Interview Scale was developed by Zarit et al. in 1980 and adapted into Turkish by İnci in 2008. The caregiving burden scale consists of 22 statements that determine the effect of caregiving on the individual's life. The scale has Likert-type ratings ranging from 0 to 4 as "never", "rarely", "sometimes", "often", or "almost always". A minimum of 0 and a maximum of 88 points can be obtained from the scale. The items in the scale are generally related to the social and emotional domain, and a high score indicates that the distress experienced is high (İnci and Erdem, 2008; Zarit, 1980). In the studies conducted, the internal consistency coefficient of the scale was found to be between 0.87 and 0.94, and the test-retest reliability was found to be 0.71. In this study, the internal consistency coefficient of the scale was found to be 0.89.

Self-Perceived Burden Scale

The Self-Perceived Burden Scale was developed by Cousineau et al. in 2003. A 5-point Likert-type (1-never, 5-always) scale consisting of 10 items is scored between 10-50. It is stated that as the score increases, the load increases. In the validity and reliability study of the original scale, the cronbach alpha value was found to be .85 (Cousineau et al., 2003). The Turkish validity and reliability of the scale was done by Demir Barutcu and Mert (2017). In the validity and reliability study, the internal consistency coefficient of the scale was found to be 0.88 (Demir Barutcu and Mert, 2017). In this study, the internal consistency coefficient of the scale was found to be 0.87.

Data Analysis

For data analysis, the SPSS 22.0 software (SPSS, Inc., Chicago, IL, USA) was used. A test of hypothesis with p value of <0.05 was considered significant. In the analysis of the data, number, percentage, mean, standard deviation, t test were used as descriptive statistics. The Pearson correlation test was used to evaluate the relationship between the scale. The statistic 'r' value of 0.00 to 0.24 was considered a weak relationship; 0.25 to 0.49 was a moderate relationship; 0.50 to 0.74 was a strong relationship; and 0.75 to 1.00 was a very strong relationship (Aksakoğlu, 2006).

Ethical Considerations

Prior to using the scale, permission was obtained from the author who developed the scale via electronic mail. Verbal and written informed consent was obtained from the participants in the study. Written permission from Dokuz Eylül University Ethical Committee (1769-GOA 2014/34-18 and the Dokuz Eylül University Hospital (99577370-11338) was also obtained. The objective of the research was explained to the participants and written permission was received from those agreeing to participate in the research.

To cite this article: DEMİR BARUTCU C, MERT H. (2022). Comparison of Perceived Burden of Patients with Hearth Failure and their Caregivers. MAKU J. Health Sci. Inst., 10(1), 62-70.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

Table 1. Socio-demographic and disease-related characteristics of the patients and caregivers.

	Patients (n=95) $\overline{x}$ ± SD		**Caregivers (n=95) $\overline{x}$ ± SD**	
Age	71.12± 10.81 **(min:47-max:90)**		57.35±12.87 **(min:23-max:85)**	
Disease duration/caregiving period (years)	7.8±6.9 **(1-26)**		6.5±5.7 **(1-20)**	
Left ventricular ejection fraction (LVEF) (%)	37.61 ± 9.72		*	
	n	**%**	**n**	**%**
Gender				
Female	44	46.3	67	70.5
Male	51	53.7	28	29.5
Marital status				
Married	76	80.0	83	87.4
Single	19	20.0	12	12.6
Educational level				
Not literate	15	15.8	13	13.7
Primary /Secondary	55	57.9	35	36.8
High School/University	25	26.3	47	49.5
Working status				
Yes	**		35	36.8
No			60	63.2
Social insurance				
Have	95	100	91	95.8
Have not	0	0	4	4.2
Income status				
Income more than expenditure	**		19	20.0
Income less than expenditure			32	33.7
Income is equal to expenditure			44	46.3
Chronic disease				
Have	78	82.1	44	46.3
Have not	17	17.9	51	53.7
His/her relationship to patient				
Spouse	**		56	58.9
Adult child			31	32.6
Others (relatives, friend, etc.)			8	8.4
Living together				
Yes	**		76	80.0
No			19	20.0
Total	**95**	**100.0**	**95**	**100.0**

Abbreviation: SD, standard deviation.
* Was not asked to the caregiver
** Was not asked to the patient

Results

The mean age of the caregivers was 57.35±12.87 years, and the mean caregiving period was 6.5±5.7 years. 70.5% of caregivers are women, 87.4% are married, 49.5% are high school graduates and above, 36.8% of caregivers are working. 95.8% of caregivers have social security and 46.3% of them have income status equal to expenditure. It was determined that 46.3% of the caregivers had another chronic disease and 58.9% of the

To cite this article: DEMİR BARUTCU C, MERT H. (2022). Comparison of Perceived Burden of Patients with Hearth Failure and their Caregivers. MAKU J. Health Sci. Inst., 10(1), 62-70.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

caregivers were spouses, 32.6% were adult children, and 8.4% were other relatives and friends. 80% of caregivers live in the same house with the patient (Table 1).

The mean age of the patients was 71.12 ± 10.81 years. The mean duration of heart failure of the patients was 7.8±6.9 years. The mean left ventricular ejection fraction (LVEF) value of the patients was 37.61±9.72. 53.7% of the patients are male, 80% are married, 57.9% are primary school graduates and all of them have social security. 82.1% of the patients have another chronic disease (Table 1).

The mean score of the patients on the self-perceived burden scale was found to be 28.41 ± 9.72, and the score of the caregivers from the scale of burden interview was found to be 32.56 ± 18.43 (Table 2). It was determined that there was a moderately significant positive correlation between the patients' self-perceived burden scale and the caregivers' mean scores of the burden interview scale (r=.489 p=.000) (Table 3).

Table 2. Scores of self perceived burden and burden interview scale (n=95)

Scales	Min	Max	$\bar{x}$ ± SD
Self-Perceived Burden Scale	11.00	47.00	28.41 ± 9.72
Burden Interview Scale	4.00	81.00	32.56 ± 18.43

Table 3. Relationship between self perceived burden and burden interview scale **scores** based on their socio-demographic and disease-related characteristics

	Self Perceived Burden Scale		Burden Interview Scale	
Patients Age	r = 0.312	**p=0.002***	r=0.275	p=**0.007***
Disease duration (years)	r= 0.241	**p=0.019***	r= 0.046	p=0.660
Caregivers age	r= -0.022	p=0.829	r= 0.090	p=0.386
Caregiving period (years)	r= 0.277	**p=0.007***	r = 0.040	p=0.699
		r=0.489	**p=.000***	

***p<0.05**

Discussion

In the study, it was found that the caregiver burden of caregivers was slightly lower than moderate, according to the score obtained from the sum of the scale.

In studies with heart failure patients and their caregivers, our sample group; Hu and colleagues (2016) a multidisciplinary supportive program for caregivers of patients with heart failure, caregiver burden, and depression in a study to test the effects on quality of life, supportive multidisciplinary program for caregivers of heart failure patients have been found to have positive effects. It has been determined that caregivers have a high burden and need support. In the study conducted by Agren et al. (2015) to evaluate the effects of psycho-educational intervention on caregiver burden in caregivers of patients with heart failure, it was found that education did not reveal significant effects in reducing the burden of caregivers. Man et al. (2018) examined the effects of home palliative heart failure program on quality of life, symptom burden, functional status, patient satisfaction and caregiver burden among patients with heart failure. It has been found to be effective in reducing caregiver burden. Mclfatrick et al. (2018) conducted a study to determine the psychosocial factors associated with caregiver burden in heart failure and to evaluate the support needs of caregivers, and it was determined that more than half (53%) of caregivers had distress

To cite this article: DEMİR BARUTCU C, MERT H. (2022). Comparison of Perceived Burden of Patients with Hearth Failure and their Caregivers. MAKU J. Health Sci. Inst., 10(1), 62-70.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

levels related to depression (Zarit Burden score >24). As a result of the qualitative analysis, it was determined that caregivers wanted emotional support from someone who understood them, needed information about the disease process, wanted information about how and where to get support, and what to expect at the end of life. Strömberg and Luttik (2015) stated that the lives of caregivers are severely affected by heart failure, heart failure patients and their caregivers do not have enough information about prognosis and end-of-life care, and they cannot communicate adequately with the healthcare team. Durante et al. (2019) in their study to determine the caregiver and patient determinants of the caregiver burden in heart failure, and to evaluate the caregiver's contribution to heart failure, determined that the determinants of caregiver burden are old age, female gender, fewer care hours and poor social support. Hu et al. (2016) investigated caregiver burden among family caregivers of patients with heart failure and found that caregiver burden was associated with monthly family income, relationship with the patient, caregivers' self-efficacy, and social support. In parallel with the results of the studies investigating the burden of caregivers with heart failure in the literature, the burden perceived by the caregivers was found to be moderate in our study. In Turkish society, it is thought that giving care to the person in need of care in the family is perceived as a duty and responsibility, and in parallel with this, caregivers are not aware of the burden they experience during the caregiving process and have difficulty in expressing the difficulties they experience. This situation was evaluated as caregivers' low awareness of the burden in the caregiving process or they submitted to this situation within the scope of learned helplessness.

In the study, it was determined that the burden perception of the patients was higher than the moderate level according to the score obtained from the total scale, that is, the patients perceived themselves as a burden to their caregivers. In the study conducted by Jıng and Wang (2017) to investigate the burden perceived by patients with chronic heart failure and related factors, it was determined that the score of the patients on the self-perception scale was (24.84±6.74) and it was mild-moderate. Factors such as age, gender, and self-efficacy were associated with perceived burden in patients with chronic heart failure. In the study conducted by Aldred (2005), heart failure patients and their caregivers stated that the disease affects their whole life, the patients feel unhappy because it creates a burden on their caregivers, that social isolation affects both the patient and the caregiver negatively, and that they need professional support even though they need it in this period. stated that they did not receive it. It has been determined that the number of studies evaluating the self-perception of burden in heart failure patients is limited in the literature. In the literature, there are studies in which patients in different sample groups consider themselves as a burden. Accordingly, Xu et al (2021) patients with gastrointestinal tumors, Ritche et al (2017) cancer patients, Ahmed et al (2022) and Ribe et al (2018), schizophrenia patients, Grace et al (2018) patients with hemolytic anemia, Fishbain et al. (2016) conducted studies on patients with chronic pain to perceive themselves as a burden. According to the results of the study, it was found that the patients felt dependent on their caregivers, felt uncomfortable with this situation, and experienced psychological anxiety, depression, and guilt, and these feelings negatively affected the caregivers' physical, mental and emotional health. In addition, it has been stated that care for the chronic patient will cause the caregiver to be restricted and stressed after a certain period of time, as a result of which the perceptions of the patients receiving care may change and their end-of-life decisions may be affected. The degree of burden of individuals with chronic diseases and their relationships with their caregivers may cause anxiety, depression and treatment non-compliance. All these affect the patients' decision on life expectancy, and with the increase in burden perception, euthanasia requests may increase. In this whole process, it has been found that individuals experience feelings of loss of control and independence, guilt, indebtedness, worry about the caregiver, the thought of negatively affecting the health of the caregiver due to physical

To cite this article: DEMİR BARUTCU C, MERT H. (2022). Comparison of Perceived Burden of Patients with Hearth Failure and their Caregivers. MAKU J. Health Sci. Inst., 10(1), 62-70.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

strain while giving care, anger, disappointment and helplessness. It has been found that there is a positive relationship between the performance ability of the patients and the perception of being a burden, and the perception of burden increases when the need for care increases. At the same time, it has been stated that the feelings and burden perceptions experienced by the care recipients vary according to geographical areas and culture. In addition, it was stated that the patients who received care for a long time perceived themselves as a greater burden and the perception of the care recipients to create a burden on their caregivers gradually increased. (Oeki et al., 2012). End-stage renal disease patients stated that they needed caregivers to maintain their daily living activities, they thought that caregivers were restricted due to their diseases, they lost their independence, and they were grateful for them. Patients stated that providing care is stressful and difficult. It has been stated that the feelings of care recipients are not given enough importance. It was found that the burden perception of the patients was multidimensional, related to the degree of chronic disease and affecting their relationship with the caregiver, and experienced negative emotions such as the feeling of limiting the caregiver, disappointment, guilt, anxiety, and depression. For this reason, it was stated that such patients had attempted suicide or had euthanasia requests (Arechabala et al., 2012). In the study of Özer et al. (2006), the caregivers of the patients; It has been found that they see themselves as a burden to their caregivers because they are tired, worried about their health, causing economic distress and disrupting their daily plans.

According to the results of the study, it was determined that there was a moderately significant positive correlation between the patients' self-perception of burden scale and the caregivers' mean scores of the caregiving burden scale (r=.489 p=.000). As the burden score perceived by the patients increases, the perceived burden score of the caregiver increases. This shows that as the burden perceived by the patients increases, the perception of caregiver burden increases.

Conclusion

Nursing care has a very important place in reducing the negative effects of chronic disease on the individual, family and society. Nursing care to be applied in this context should be planned to include the individual and the family. The nurse should lead the way in helping the patient's personal control, informing the patient and caregivers, ensure the participation of the individual in his own care, implement training programs that will increase the quality of life, including the patient and his family, and follow the individuals regularly. While evaluating the individuals who care for patients with chronic and loss of function holistically, considering the care burden in terms of both the caregiver and patients, determining the factors affecting the care burden, determining the needs, health conditions and support resources of the individual and the caregiver, the individuals and the individuals in the institution and home environment. It is recommended for caregivers to plan interventions to reduce the burden of care, to conduct extensive research and follow-ups showing the effectiveness of these interventions, and to evaluate the self-perceived burden separately from physical, emotional and financial aspects in future studies.

References

Arechabala, M., Catoni, M., Barrios, S., Palma, E., 2012. Spanish validation of the "self-perception of burden of care scale". Acta Paulista de Enfermagem 25(1), 140-5.

Aldred, H., Gott, M., Gariballa, S., 2005. Advanced heart failure:impact on older patients and informal carees. The Journal of Advanced Nursing 49, 116-124.

Aksakoğlu, G., 2006. Research and Analysis in Health. 2nd Edition, D.E.Ü. Rektörlük Basımevi, Izmir.

Ågren, S., Strömberg, A., Jaarsma, T., Luttik, M.L., 2015. Caregiving tasks and caregiver burden; effects of an psycho-educational intervention in partners of patients with post-operative heart failure. Heart & Lung 44, 270- 275.

Ahmed, H.A., Ghaith, H., 2018. Effect of psycho-educational program on families' perception of burden and attitudes toward mental illness among caregivers of

To cite this article: DEMİR BARUTCU C, MERT H. (2022). Comparison of Perceived Burden of Patients with Hearth Failure and their Caregivers. MAKU J. Health Sci. Inst., 10(1), 62-70.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

patients with schizophrenia. Egyptian Nursing Journal 15, 331–344.

Barutcu, C.D., Mert, H., 2017. The psychometric properties of the turkish version of the self-perceived burden scale. International Journal of Caring Sciences 10(1), 30-36.

Bidwell, J.T., Vellone, E., Lyons, K.S. et al., 2015. Determinants of heart failure self-care maintenance and management in patients and caregivers: a dyadic analysis. Research in Nursing & Health 38, 392–402.

Cousineau, N., Mcdowell, I., Hotz, S., Hébert, P., 2003. Measuring chronic patients' feelings of being a burden to their caregivers development and preliminary validation of a scale. Medical Care 41(1), 110–118.

Durante, A., Greco, A., Annoni, A.M., Steca, P., Alvaro1, R., Vellone, E., 2019. Determinants of caregiver burden in heart failure: does caregiver contribution to heart failure patient self-care increase caregiver burden? European Journal of Cardiovascular Nursing 18(8), 691–699.

Fishbain, D.A., Bruns, D., Bruns, A., Gao, J., Lewis, J.E., Meyer, L., 2016. The perception of being a burden in acute and chronic pain patients ıs associated with affirmation of different types of suicidality. Pain Medicine 17, 530–538.

Grace, RF., Cohen, J., Egan S., Wells, T., Witherspoon, B., Ryan, A., Salek, S., Bodie, S., 2018. The burden of disease in pyruvate kinase deficiency: Patients' perception of the impact on health-related quality of life. European Journal of Haematology 101, 758–765.

Greco, A., Pancani, L., Sala, M., 2017. Psychometric characteristics of the caregiver burden inventory in caregivers of adults with heart failure. European Journal of Cardiovascular Nursing 16, 502–510.

Hwang, B., Moser, D.K., Dracup, K., 2014. Knowledge is insufficient for self-care among heart failure patients with psychological distress. Health Psychology 33, 588–596.

Hu, X., Dolansky, M.A., Su, Y., 2016. Effect of a multidisciplinary supportive program for family caregivers of patients with heart failure on caregiver burden, quality of life, and depression: a randomized controlled study. International Journal of Nursing Studies 62, 11–21.

İnci, F.M., Erdem, M., 2008. Validity and reliability of the Turkish adaptation of the caregiving scale. Atatürk Üniversitesi Hemşirelik Yüksekokulu Dergisi 11(4), 85-95.

Jaarsma, T., Strömberg, A., Ben, Gal., 2013. Comparison of self-care behaviors of heart failure patients in 15 countries worldwide. Patient Education and Counseling 92, 114–120.

Jing, Y., Wang, J., 2017. Self perceived burden and its influencing factors in patients with chronic heart failure. Modern Clinical Nursing 16(2), 9-14.

Kowal, J., Wilson, K., McWilliams, L., Péloquin, K., Duong, D., 2012. Self-perceived burden in chronic pain: Relevance, prevalence, and predictors. PAIN 153, 1735–1741.

McIlfatrick, S., Doherty, L.C., Murphy, M., Dixon, L., Donnelly, P., McDonald, K., Fitzsimons, D., 2018. The importance of planning for the future': Burden and unmet needs of caregivers' in advanced heart failure: A mixed methods study. Palliative Medicine 32(4), 881–890.

McPherson, C.J., Wilson, K.G., Murray, M., 2007. Feeling like a burden: exploring the perspectives of patients at the end of life. Social Science & Medicine 64, 417–27.

Man, A.Y., Wong, F.K., 2018. Effects of a home-based palliative heart failure program on quality of life, symptom burden, satisfaction and caregiver burden: a randomized controlled trial. Journal of Pain and Symptom Management 55(1), 1-11.

Molloy, G.J., Johnston, D.W., Witham, M.D., 2005. Family caregiving and congestive heart failure. review and analysis. European Journal of Heart Failure 7(4), 592–603.

Nieminen, M.S., Dickstein, K., Fonseca, C., 2015. The patient perspective: quality of life in advanced heart failure with frequent hospitalisations. International Journal of Cardiology 191, 256–264.

Oeki, M., Mogami, T., Hagino, H., 2012. Self-perceived burden in patients with cancer: Scale development and descriptive study. European Journal of Oncology Nursing 16, 145-152.

Özer, N., Hacıalioğlu, N., Çevik Akyıl, R., Akpınar, R., 2006. The situation of patients feeling as a burden to their caregivers relatives. Atatürk Üniversitesi Hemşirelik Yüksekokulu Dergisi 9(4), 31-37.

Özer, S., 2010. Quality of life of patients and caregivers with dementia. Turkish Journal Of Geriatrics 13(3), 27-35.

Ritchie, C.S., Zhao, F., Patel, K., Manola, J., Kvale, E., Snyder, C., Fisch, M., 2017. Association between patients' perception of the comorbidity burden and

symptoms in outpatients with common solid tumors. Cancer 3835-3842.

Ribé, J.M., Salamero, M., Pérez-Testor, C., Mercadal, J., Aguilera, C., Cleris, M., 2018. Quality of life in family caregivers of schizophrenia patients in Spain: caregiver characteristics, caregiving burden, family functioning, and social and professional support. International Journal of Psychiatry in Clinical Practice 22(1), 25-33.

Savarese, G., Lund, L.H., 2017. Global public health burden of heart failure. Cardiac Failure Review 3, 7–11.

Strömberg, A., Luttik, M.L., 2015. Burden of caring: risks and consequences imposed on caregivers of those living and dying with advanced heart failure. Current Opinion in Supportive and Palliative Care 9, 26–30.

Williams, S. W., Williams, C. S., Zimmerman, S., Munn., J., Dobbs, D., Sloane, P. D., 2008. Emotional and physical health of informal caregivers of residents at the end of life: The role of social support. Journal of Gerontology: Social Science 63, 171-183.

Wilkins, E., Wilson, L., Wickramasinghe, K., Bhatnagar, P., Leal, J., Luengo-Fernandez, R., Townsend, N., 2017. European Cardiovascular Disease Statistics 2017. Brussels: European Heart Network. http://www.ehnheart.org/images/CVD-statistics-report-August-2017.pdf (Accessed 12 Jan 2022).

Xu, W., Tang, J., Chen, J., 2021. Influence of diagnostic ınforming on negative emotions, ıllness perception, self-perceived burden, and posttraumatic stress disorder in patients with gastrointestinal tumors. Hindawi Evidence-Based Complementary and Alternative Medicine 1-6.

Vellone, E., Riegel, B., Alvaro, R., 2019. A situation-specific theory of caregiver contributions to heart failure self-care. Journal of Cardiovascular Nursing 34, 166–173.

Zarit, S.H., Reever, K.E., Bach-Peterson, J., 1980. Relatives of the impaired elderly: correlates of feelings of burden. Gerontologist 20, 649-655.

To cite this article: DEMİR BARUTCU C, MERT H. (2022). Comparison of Perceived Burden of Patients with Hearth Failure and their Caregivers. MAKU J. Health Sci. Inst., 10(1), 62-70.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

MAKU J. Health Sci. Inst. 2022, 10(1): 71-78.
doi: 10.24998/maeusabed.1091135

Mehmet Akif Ersoy University
Journal of Health Sciences Institute
http://dergipark.gov.tr/maeusabed

Research Article / Araştırma Makalesi

Effects of Hemoglobin and Albumin Levels on the Development of Pressure Injury in Inpatients in Intensive Care

Yoğun Bakım Kliniklerinde Yatan Hastalarda Hemoglobin ve Albumin Değerlerinin Basınç Yarası Gelişine Etkisi

Elçin EFTELİ[1*]

[1]Burdur Mehmet Akif Ersoy University, Faculty of Health Science, Department of Fundamentals of Nursing, Burdur, Turkey

Abstract: Pressure injury are accepted as an indicator of inadequate care all over the world. It also prolongs the length of hospital stay and increases the rates of mortality and morbidity. In our study, the effects of hemoglobin and albumen values on the development of pressure injury were investigated. Personal Information Form and EFGU Pressure Ulcer Risk Assessment Scale were used to collect the study data. The sample of the descriptive study consisted of 68 adults over the age of 18 who were hospitalized in intensive care clinics between November 2021 and March 2022. The mean age of the patients included in the study was 67.08±14.35 years. Of them, 42.6% were women, 17.6% were intubated, and 57.4% had the normal state of consciousness. The rate of pressure injury development in patients was 26.5%. In our study, it was determined that hemoglobin and albumin values in patients with pressure injury hospitalized in intensive care clinics were lower than those without pressure injury, and the difference was statistically significant.

Keywords: Pressure injury, Hemoglobin, Albumin.

Öz: Bası yaraları tüm dünyada bakımın yetersizliğinin bir göstergesi olarak kabul edilmektedir. Ayrıca hastanede yatış süresini uzatmakta ve mortalite ve morbitide oranlarını da arttırmaktadır. Çalışmamızda hemoglobin ve albümün değerlerini basınç yarası gelişimi üzerine olan etkisi incelenmiştir. Araştırma verilerinin toplanmasında Kişisel Bilgi Formu ve EFGU Basınç Ülseri Risk Değerlendirme Ölçeği kullanılmıştır. Tanımlayıcı tipte olan araştırmanın örneklemini Kasım 2021 – Mart 2022 tarihleri arasında yoğun bakım kliniklerinde yatan 18 yaş üzeri 68 yetişkin birey oluşturdu. Çalışma kapsamına alınan hastaların yaş ortalamalarının 67.08±14.35, %42.6'sının kadın, %17.6'sının entübe, %57.4'ünün normal bilinç düzeyine sahip olduğu belirlendi. Hastalarda bası yarası gelişme oranı %26.5'dir. Çalışmamızda yoğun bakım kliniklerinde yatan, bası yarası gelişen hastalarda hemoglobin ve albümin değerlerinin bası yarası gelişmeyen hastalara göre daha düşük olduğu ve farkın istatistiksel olarak anlamlı olduğu belirlenmiştir.

Anahtar Kelimeler: Bası yarası, Hemoglobin, Albumin.

*Corresponding author : Elçin EFTELİ e-mail : eulker@mehmetakif.edu.tr
Geliş tarihi / Received : 21.03.2022 Kabul tarihi / Accepted: 04.04.2022

Introduction

Pressure injuries which are localized skin and / or subcutaneous tissue damage that occurs on bony prominences are usually caused by pressure alone, or by the combination of shearing and pressure (EPUAP/NPIAP/PPPIA: 2019). Pressure injuries, which are accepted as an indicator of quality of the health service provided in treatment institutions, increase mortality, morbidity rates and treatment costs (Bahar and Özgürbüz, 2022; Brito et al., 2013; Kottner and Peytavi, 2021).

According to the results compiled by the National Pressure Ulcer Advisory Panel (NPUAP) from 300 studies, the incidence of pressure injuries ranges between 0.4% and 38% in acute care areas and between 2.2% and 23.9% in long-term care areas (EPUAP 2016). In studies conducted in Europe, this rate varies between 8.3% and 25.1% (Gencer et al., 2018; Neziraj et al., 2021; Kalmann

To cite this article: EFTELİ E. (2022). Effects of Hemoglobin and Albumin Levels on the Development of Pressure Injury in Inpatients in Intensive Care Clinics. MAKU J. Health Sci. Inst., 10(1), 71-78.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

and Suserud, 2008). In studies conducted in our country, the rate varies between 14% and 54.8% (Çınar et al.,2018; Çelik 2016; İnan and Öztunç, 2012). The main risk factors stated to predispose to scar formation in the literature are restriction of mobility and activity. Along with this, factors that impair tissue oxygenation or perfusion, poor general health of the patient, decreased sensation, advanced age, nutritional deficiency and related hematological and biochemical changes also play a role in the formation of pressure injuries (Langemo et al., 2015; NPIAP/ EPUAP/ PPPIA:2014; Coleman et al., 2013; Tsaras et al., 2016; Stephen-Haynes 2012).In particular, factors such as restricted mobility, impaired tissue perfusion, dyspnea, edema, malnutrition, and decreased sensory perception due to analgesia also explain the formation of pressure injuries that are frequently encountered in patients staying in intensive care or palliative care units (Langemo et al., 2015; Stephen-Haynes 2012; Artico et al., 2018). Various methods such as body mass index, calculation of calories taken, measurement of albumin, prealbumin, hemoglobin, hematocrit, and scoring with malnutrition scales are used to determine the nutritional status of patients receiving intensive care (Langemo et al., 2015). Albumin is a frequently measured parameter since it is thought to indicate whether the amount of protein in the body is adequate, and to play a role in wound healing because it carries zinc, which plays a role in collagen formation (Taylor 2017). In recent studies, it has been demonstrated that albumin provides information not only about the nutritional status of the patient but also about the severity of the underlying disease and the prognosis of the patient (Dorner et al., 2009; Bouillanne et al., 2011; Sugino et al., 2014). In the literature, in several studies, blood parameters have been used to investigate the relationship between nutrition and pressure injuries While in several publications, hypoalbuminemia has been shown as a risk factor for scar formation (Efteli and Güneş 2013; Serra et al., 2014; Bly et al., 2016), Anthony et al. (2011) argue that albumin is a valuable parameter to be used in wound scoring. In addition to albumin, the hemoglobin value also gives an idea about the nutritional status; therefore, the relationship between the hemoglobin value and pressure injuries has been investigated. In several publications, the presence of anemia has been shown to increase the risk of injury formation in patients receiving intensive care or palliative care (Bly et al., 2016: Landi et al., 2007). Especially in older patients, anemia, due to its association with fragility, is thought to increase wound formation and to slow down wound healing (Landi et al., 2007). It is important to keep the albumin and hemoglobin values, which are nutritional parameters, at the desired level in order to prevent the development of pressure injury and to accelerate the healing in patients with pressure injury.

In our study, it was aimed to reveal the effect of albumin and hemoglobin levels on the development of pressure injuries in patients hospitalized in intensive care clinics.

Materials and Methods

Design and setting

This methodological study was carried out in the intensive care units of a public hospital between November 1, 2021 and March 1, 2022.

Sample

68 patients recently admitted to the units where the study was conducted were included in the study. The inclusion criteria were as follows: being over the age of 18 years, having no pressure injuries, being bedridden, and having been hospitalized for at least six days. The exclusion criteria were as follows: having a pressure injury on admission to the hospital, and taking inotropic and/or vasopressor drugs.

Instrument Data Collection Tools

Personal Information Form and EFGU Pressure Ulcer Risk Assessment Scale both of which were developed by the researcher were used to collect the study data.

Personal Information Form: The form includes five questions on the participants' age, sex,

To cite this article: EFTELİ E. (2022). Effects of Hemoglobin and Albumin Levels on the Development of Pressure Injury in Inpatients in Intensive Care Clinics. MAKU J. Health Sci. Inst., 10(1), 71-78.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

albumin and hemoglobin levels, and pressure injury development.

EFGU Pressure Ulcer Risk Assessment Scale: The scale was developed by Efteli and Güneş in 2020 to determine the risk of pressure injury formation in patients receiving intensive care. The scale has seven items questioning variables such as age, diastolic blood pressure levels, skin condition in risky areas, feeling of discomfort and pain in areas under pressure, skin tolerance test results, incontinence, and small changes in the body position. Each scale item was scored ranging from 0 to 3. Age and diastolic blood pressure were scored as 0-1 points. The condition of the skin in the risky areas, the feeling of discomfort and pain in the areas under pressure and the skin tolerance test results were scored as 0-2 points. Incontinence and small changes in the body position were scored as 0-3 points. The minimum and maximum possible scores to be obtained from the scale are 0 and 14 respectively. A score of ≥6 indicates that the risk of developing pressure injury is high. The Cronbach's alpha coefficient of the scale was 0.81.

Procedure

The patients were evaluated using the EFGU Pressure Ulcer Risk Assessment Scale in the first 24 hours of admission, and then they were followed up once a week for 12 weeks, or until they developed pressure injury or they were discharged. Hemoglobin and albumin values of the patients were recorded and averaged for assessment.

Data analysis

The analysis of the data obtained within the scope of the research was performed by an expert specialized in the field of Biostatistics using the Statistical Package for Social Science (SPSS) 16.0 (SPSS Inc., Chicago, IL, USA) program.

Ethical consideration

Before the study was conducted, ethical approvals were obtained from Burdur Mehmet Akif Ersoy University Non-Interventional Research Ethics Committee, permission to conduct the study from Burdur State Hospital where the study was to be conducted and written informed consent from the patients or their relatives who agreed to participate in the study.

Table 1. Patient characteristics.

Gender n (%)	
Female	29 (42.6%)
Male	39 (57.4%)
Age (mean,SD)	67.08±14.35
Follow-up time (mean,SD)	10.66±5.52
Conscious status n (%)	
Normal verbal response	39 (57.4%)
No response	13 (19.1 %)
Pressure sore development n (%)	18 (27.1 %)
EFGU Scale Score (mean,SD)	
Pressure injury developing	8.88±1.23
Pressure injury not developing	3.04±2.46

Results

The mean age of the patients included in the study was 67.08±14.35 years. Of them, 42.6% were women, 17.6% were intubated, and 57.4% had the normal state of consciousness. The rate of pressure injury development in patients was 26.5% (Table 1). While the mean age of the participants who developed pressure injury was 74.83±11.02 years, that of the patients who did not develop pressure injury was 64.30±14.48 years, and the difference between them was statistically significant (p=0.007, t= 2.802).

The mean score the participating patients obtained from the EFGU Pressure Ulcer Risk Assessment Scale was 4.58±3.4. Of them, 41.2% were at risk of developing pressure injury. Of the participants who were at risk of developing pressure injury 64.2% developed pressure injury. All the patients who developed pressure injuries were in the at-risk group.

The mean hemoglobin level was 11.86±1.798 in the participants who were at risk of developing pressure injury was, and 12.70±2.39 in the participants who were not at risk. The mean

To cite this article: EFTELİ E. (2022). Effects of Hemoglobin and Albumin Levels on the Development of Pressure Injury in Inpatients in Intensive Care Clinics. MAKU J. Health Sci. Inst., 10(1), 71-78.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

hemoglobin level was low in the participants who were at risk of developing pressure injury, but the difference between the groups was not statistically significant (p=0.132, t=1.524) (Table 2).

The mean albumin level was 3.34±0.48 in the participants who were at risk of developing pressure injury, and 3.72±0.52 in the participants who were not at risk. The mean albumin level was low in the participants who were at risk of developing pressure injury, and the difference between the groups was statistically significant (p=0.003 t=3.032), (Table 2).

The mean hemoglobin level was 11.41±1.75 in the patients who developed pressure injuries and 12.70±2.33 in the patients who did not develop pressure injuries. The difference between the groups was statistically significant (p=0.036, t=2.137), (Table 3)The mean albumin level was 3.35±0.45 in the patients who developed pressure injuries and 3.64±0.54 in patients who did not develop pressure injuries. The difference between the groups was statistically significant (p=0.046, t=2.033) (Table 3).

Table 2. Hemoglobin and Albumin Values According to Pressure Injury Risk.

	Hemoglobin	**Albumin**
Pressure injury risk	**X ± Ss**	**X ± Ss**
Yes (n=28)	11.86±1.98	3.34±0.48
No (n=40)	12.70±2.39	3.72±0.52
	p=0.132 t=1.524*	p=0.003 t=3.032*

*Student t test, Significance level: p<0.05.

Table 3. Hemoglobin and Albumin Values according to Pressure Injuries Development.

	Hemoglobin	**Albumin**
Pressure injury development	**X ± Ss**	**X ± Ss**
Yes (n=18)	11.41±1.75	3.35±0.45
No (n=50)	12.70±2.33	3.64±0.54
	p=0.036 t=2.137*	p=0.046 t=2.033*

*Student t test, Significance level: p<0.05.

Discussion

In our study, the incidence of pressure injuries was 26.5%. The incidence of developing pressure injuries was 27.1% in the study conducted by Efteli and Güneş (2020) in intensive care units, 31.4% in the study conducted by Katran (2015) in a surgical intensive care unit, 15% in the study conducted by Tokgöz and Demir (2010) in a neurology intensive care unit, and 59% in Kıraner et al.'s (2016) study conducted in intensive care units and 28.3% in Tosun and Bölükbaş's (2015) study. Our study results are consistent with those in the literature.

While the mean age of the patients who developed pressure injuries was 74.83 in our study, it was ≥65 years in other studies (Kurtuluş and Pınar, 2013; Katran 2015; Tokgöz and Demir, 2010; Turgut et al., 2017; Gül et al., 2016). There are also studies in the literature indicating that the risk of pressure injury development increases as the age increases (Perneger et al., 2002; Gunningberg et al., 2001; Halfens et al., 2000; Lindgren et al., 2004; Serpa et

To cite this article: EFTELİ E. (2022). Effects of Hemoglobin and Albumin Levels on the Development of Pressure Injury in Inpatients in Intensive Care Clinics. MAKU J. Health Sci. Inst., 10(1), 71-78.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

al., 2007; Vanderwee et al., 2009; Hatanaka et al., 2008).

In the literature, it has been reported that malnutrition is a risk factor for the development of pressureinjuries, that hypoalbuminemia promotes the development of pressure injuries, and that the incidence of pressure injuries increases especially in patients whose albumin levels are below 3.5 g/dl (Girgin Kelebek ve Erarı Kurhan, 2007; Çınar et al., 2018; Alaca et al., 2001; Anthony et al 2011). Low albumin level causes interstitial edema, and thus accelerates the development of pressure sores and delays wound healing. In our study, pressure injuries developed in the patients whose albumin level was 3.35±0.45 (reference value: 3.5-5.2 g/dl). On the other hand, in Ersoy et al.'s (2013) and Terekeci et al.'s (2009) studies conducted with intensive care patients, of the patients, those whose serum albumin level was lower than 2.5 g/dl developed pressure injuries. In their study Inozu et al. (2012), determined that the albumin level was 2.53±0.25 g/dl in older patients who were hospitalized for surgical treatment and developed pressure injuries. In studies conducted with different patient groups, it was determined that the average albumin level of the patients who developed pressure injuries was lower (Kıraner et al., 2016; Tosun and Bölüktaş, 2015; Tokgöz and Demir, 2010). In Kurtuluş and Pınar's (2013) study, although the albumin level was low in the group with pressure sores, no statistical relationship was determined between the albumin level and the development of pressure injuries.

When the hemoglobin level is lower than 12 g/dl, oxygen carrying capacity of the blood and tissue resistance decrease seriously, and ischemia occurs. If ischemia is accompanied by anemia, cell metabolism is at a greater risk. Low hemoglobin level increases the risk of pressure injuries (Fogerty et al., 2008 Jaul 2001; Williams et al., 2001), and the hemoglobin level lower than 10 g/dl facilitates pressure injury development and makes it difficult to heal (Ersoy et al., 2013; Ullah and Alam, 2012). In our study, the mean hemoglobin level of the patients who developed pressure injuries was 11.41±1.75 (reference value 11.7–15.5 g/dl). In Tosun and Bölüktaş's (2015) study, the mean hemoglobin level was 10.1±2.0 in the group with pressure injuries. In a study conducted with 40 patients with pressure injuries, it was determined that injury healed in parallel to the treatment of anemia (Fuoco et al., 1997). Kıraner et al. (2016) determined that the hemoglobin level of the patients who developed pressure injuries in the intensive care unit was 7.6 g/dl. However, in some studies, it is reported that anemia does not affect the development of pressure injuries (Kurtuluş and Pınar 2013; Alaca et al., 2001)

On the other hand, in their prospective study conducted with 210 intensive care patients, Tsaras et al. (2016) determined that a one-unit increase in hematocrit reduced the formation of pressure injuries by 9%. In our study, the hemoglobin levels of the patients who developed pressure injuries were lower than were those of the patients who did not develop pressure injuries

In our study, the assessment of the patients with the EFGU Pressure Ulcer Risk Assessment Scale demonstrated that all the patients who developed pressure injuries constituted the group at risk of developing pressure injury. The mean hemoglobin and albumin levels of the patients in the at-risk group for the development of pressure injuries were 11.86±1.798 and 3.34±0.48 respectively. No statistical relationship was determined between the hemoglobin levels and the EFGU Pressure Ulcer Risk Assessment Scale scores, but the albumin level was low in the group with pressure injury risk, and the difference between the groups was statistically significant. In Anthony's (2011) study, hemoglobin and albumin levels of the patients in the risk group were determined as low with the Waterlow Risk Assessment Scale.

Conclusion

In our study, hemoglobin and albumin values were lower in patients with pressure injuries hospitalized in intensive care clinics than were those of the patients without pressure injuries, the incidence of pressure injuries was 26.5%, and the incidence of pressure injury development was higher in patients who were at risk of developing

To cite this article: EFTELİ E. (2022). Effects of Hemoglobin and Albumin Levels on the Development of Pressure Injury in Inpatients in Intensive Care Clinics. MAKU J. Health Sci. Inst., 10(1), 71-78.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

pressure injuries according to results of the EFGU Pressure Ulcer Risk Assessment Scale. To reduce the incidence of pressure injuries in intensive care units, albumin and hemoglobin levels, which are among the nutritional parameters, should be carefully monitored in terms of pressure injurydevelopment and wound healing, patients who are at risk should be identified in the early period using risk assessment scales, and protective measures should be taken in at-risk patients.

References

Alaca, R., Hazneci, B., Göktepe, S., Gündüz, Ş., Kalyon, T.A., 2001. Spinal kord hasarlılarda bası yarası gelişimi için risk faktörleri. Gülhane Tıp Dergisi *43*(1), 25-29.

Anthony, D., Rafter, L., Reynolds, T., Aljezawi, M., 2011. An evaluation of serum albumin and the sub-scores of the Waterlow score in pressure ulcer risk assessment. Journal of Tissue Viability. 20(3), 89–99

Artico, M., Dante, A., D'Angelo, D., Lamarca, L., Mastroianni, C., Petitti, T., De Marinis, M.G., 2018. Prevalence, incidence and associated factors of pressure ulcers in home palliative care patients: A retrospective chart review. Palliative Medicine 32(1), 299–307.

Bahar, A., Özgürbüz, N.E., 2022. Validity and reliability of the Turkish version of The Pressure Injury Prevention Knowledge Questionnaire (PIPK). Journal of Tissue Viability 31(1), 30-37.

Bly, D., Schallom, M., Sona, C., Klinkenberg, D., 2016. A model of pressure, oxygenation, and perfusion risk factors for pressure ulcers in the ıntensive care unit. American Journal of Critical Care 25(2), 156–164.

Bouillanne, O., Hay, P., Liabaud, B., Duché, C., Cynober, L., Aussel, C., 2011. Evidence that albumin is not a suitable marker of body composition-related nutritional status in elderly patients. Nutrition 27(2),165–169.

Brito, P.A., Generoso, S.V., Correia, M., 2013. Prevalence of pressure ulcers in hospitals in Brazil and association with nutritional status: a multicenter, crosssectional study. Nutrition 29, 646–649. https://doi.org/10.1016/j.nut.2012.11.008.

Coleman, S., Gorecki, C., Nelson, E.A., Closs, S.J., Defloor, T., Halfens, R., Nixon, J., 2013. Patient risk factors for pressure ulcer development: Systematic review. International Journal of Nursing Studies 50(7),974–1003.

Çelik, S., 2016. Characteristics of patients hospitalized in the intensive care units of the university hospital: a retrospective analysis between 2009 and 2013. Journal of Intensive Care Nursing 20(2), 71–79.

Çınar, F., Kula, S., Şahin, S., Eti Aslan, F., 2018. Evaluation of studies in Turkey on the prevention of pressure sores in the intensive care unit: a systematic review. Balıkesir Health Sciences Journal 7(1), 42–50.

Dorner, B., Posthauer, M.E., Thomas, D., 2009. The role of nutrition in pressure ulcer prevention and treatment: National Pressure Ulcer Advisory Panel white paper 22(5),10.

Efteli, E., Güneş, Ü., 2020. Assessing the validity and reliability of a new pressure ulcer risk assessment scale for patients in ıntensive care units. Wound Management & Prevention 66(2), 24-33.

Ersoy, E.O, Öcal, S., Öz, A., Yılmaz, P., Arsava, B., Topeli, A., 2013. Yoğun bakım hastalarında bası yarası gelişiminde rol oynayabilecek risk faktörlerinin değerlendirilmesi. Yoğun Bakım Dergisi 4(1), 9-12.

European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance. Basınç Ülserlerinin/Yaralarının Önlenmesi ve Tedavisi: Hızlı Başvuru Kılavuzu 2019. (Türkçe versiyon). Emily Haesler (Ed.).EPUAP/NPIAP/PPPIA: 2019.

Fogerty, M.D, Abumrad, N.N., Nanney, L., Arbogast, P.G, Poulose, B., Barbul, A., 2008. Risk factors for pressure ulcers in acute care hospitals. Wound Repair and Regeneration 16(1), 11-18.

Fuoco, U., Scivoletto, G., Pace, A., Vona, V.U., Castellano, V., 1997. Anaemia and serum protein alteration in patients with pressure ulcers. Spinal Cord 35 (1), 58-60.

Gencer, Z.E., Ünal, E., Özkan, Ö., 2018. The cost analysis of pressure ulcer treatment; the treatment cost comparison of conventional and modern. Wound Care 12(1), 1–8.

Girgin Kelebek, N., Erarı Kurhan, G., 2007. Bası yarası bakımı. Türk Yoğun Bakım Derneği Dergisi 5, 11–13.

Gunningberg, L., Lindholm, C., Carlsson, M., Sjödén, P.O., 2001. Risk, prevention and treatment of pressure ulcers-nursing staff knowledge and documentation. Scandinavian Journal of Caring Sciences 15(3), 257-263.

Gül, Y.G., Köprülü, A.S., Haspolat, A., Uzman, S., Toptas, M., Kurtulus, İ., 2016. Braden Risk Değerlendirme Skalası yoğun bakım ünitesinde tedavi gören 3.düzey hastalarda basınç ülseri oluşumu riskini

To cite this article: EFTELİ E. (2022). Effects of Hemoglobin and Albumin Levels on the Development of Pressure Injury in Inpatients in Intensive Care Clinics. MAKU J. Health Sci. Inst., 10(1), 71-78.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

değerlendirmekte güvenilir ve yeterli mi? Journal of Academic Research in Medicine 6(2), 98–104.

Halfens, R., Van Achterberg, T., Bal, R., 2000. Validity and reliability of the Braden scale and the influence of other risk factors: a multicentre prospective study. International Journal of Nursing Studies 37, 313-9.

Hatanaka, N., Yamamoto, Y., Ichihara, K., Mastuo, S., Nakamura, Y., Watanabe, M., Iwatani, Y., 2008. A new predictive indicator for development of pressure ulcers in bedridden patients based on common laboratory tests results. Journal of Clinical Pathology 61(4), 514–518.

İnan, D.G., Öztunç, G., 2012. Pressure ulcer prevalence in Turkey: a sample from a university hospital. Journal of Wound Ostomy & Continence Nursing 39(4), 409–413.

İnözü, E., Özakpınar, H. R., Durgun, M., Eryılmaz, A. T, Selçuk, C. T, Tellioğlu, A.T., 2012. Geriatrik hastalarda bası yaralarına yaklaşım. Dicle Tıp Dergisi 39(3), 408-412.

Jaul, E., 2001. Pressure sores unit- a one year study. Harefuah, 140 (10), 903-906.

Kalmann, U., Suserud, B.O., 2008. Knowledge, attitudes and practice among nursing staff concerning pressure ulcer prevention and treatment-a survey in a Swedish healthcare setting. Scandinavian Journal of Caring Sciences23(2), 121–129.

Katran, H.B., 2015. Bir cerrahi yoğun bakım ünitesi'nde bası yarası görülme sıklığı ve bası yarası gelişimim etkileyen risk faktörlerinin irdelenmesi. Journal of Academic Research in Nursing 1(1), 8–14.

Kıraner, E., Terzi, B., Ekinci Uzun, A., Tunalı, B., 2016. Yoğun bakım ünitemizdeki basınç yarası insidansı ve risk faktörlerinin belirlenmesi. Yoğun Bakım Hemşireliği Dergisi 20(2), 78–83.

Kottner, J., Peytavi, U.V., 2021. Reliability and agreement of instrumental skin barrier measurements in clinical pressure ulcer prevention research. International Wound Journal 1–12.

Kurtuluş, Z., Pınar, R., 2003. Braden Skalası ile belirlenen yüksek riskli hasta grubunda albümin düzeyleri ile bası yaraları arasındaki ilişki. C.Ü. Hemşirelik Yüksek Okulu Dergisi 7(2), 1-10.

Landi, F., Russo, A., Danese, P., Liperoti, R., Barillaro, C., Bernabei, R., Onder, G., 2007. Anemia status, hemoglobin concentration, and mortality in nursing home older residents. Journal of the American Medical Directors Association 8(5), 322–327.

Langemo, D., Haesler, E., Naylor, W., Tippett, A., Young, T., 2015. Evidence-based guidelines for pressure ulcer management at the end of life. International Journal of Palliative Nursing 21(5), 225–232.

Lindgren, M., Unosson, M., Fredrikson, M., Ek, A.C., 2004. Immobility – a major risk factor for development of pressure ulcers among adult hospitalized patients: a prospective study. Scandinavian Journal of Caring Sciences 18(1), 57–64.

National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline. Haesler E, editor. Osborne Park, Western Australia: Cambridge Media; 2014.

Neziraj, M., Hellman, P., Kumlien, C., Andersson, M., Axelsson, M., 2021. Prevalence of risk for pressure ulcers, malnutrition, poor oral health and falls – a register study among older persons receiving municipal health care in southern Sweden. BMC Geriatrics 21(1), 265–275.

Ortaç Ersoy, E., Öcal, S., Öz, A., Yılmaz, P., Arsava, B., Topeli, A., 2013. Yoğun bakım hastalarında bası yarası gelişimde rol oynayabilecek risk faktörlerinin değerlendirilmesi. Yoğun Bakım Dergisi 4(1), 9–12.

Perneger, T.V., Rae, A.C., Gaspoz, J.M., Borst, F., Vitek, O., Heliot, C., 2002. Screening for pressure ulcer risk in an acute care hospital: development of a brief bedside scale. Journal of Clinical Epidemiology 55(5), 498–504.

Pressure ulcers prevention: quıck reference guıde. https://www.epuap.org/w p-content/uploads/2016/10/qrg_prevention_in_turkish .pdf. [accessed 28 Semptember 2021]

Serpa, L., Santos, V., Campanili, T., Queiroz, M., 2011. Predictive validity of the Braden scale for pressure ulcer risk in critical care patients. Revista Latino-Americana de Enfermagem 19(1), 50-57.

Serra, R., Caroleo, S., Buffone, G., Lugarà, M., Molinari, V., Tropea, F., de Franciscis, S., 2014. Low serum albümin level as an independent risk factor for the onset of pressure ulcers in intensive care unit patients. International Wound Journal 11(5), 550–553.

Stephen-Haynes, J., 2012. Pressure ulceration and palliative care: prevention, treatment, policy and outcomes. International Journal of Palliative Nursing 18(1),9–16.

Sugino, H., Hashimoto, I., Tanaka, Y., Ishida, S., Abe, Y., Nakanishi, H., 2014. Relation between the serum albumin level and nutrition supply in patients with pressure ulcers: retrospective study in an acute care setting. The Journal of Medical Investigation 61(1.2), 15–21.

Taylor, C., 2017. Importance of nutrition in preventing and treating pressure ulcers. Nursing Older People 29(6), 33–39.

Terekeci, H., Kucukardali, Y., Top, C., Onem, Y., Celik, S., Öktenli, Ç., 2009. Risk assessment study of the pressure ulcers in intensive care unit patients. European Journal of Internal Medicine 20(4), 394-397.

Tokgöz, O.S., Demir, O., 2010. Nöroloji yoğun bakım ünitesinde bası yara insidansı ve risk faktörleri. Selçuk Üniversitesi Tıp Dergisi 26(3), 95–98.

Tosun, Z.K., Bölüktaş, R.P., 2015. Yoğun bakım ünitelerindeki yaşlı hastalarda bası yarası prevalansı ve etkileyen faktörler. Yoğun Bakım Hemşireliği Dergisi 19(2), 43–53.

Tsaras, K., Chatzi, M., Kleisiaris, C., Fradelos, E., Kourkouta, L., Papathanasiou, I., 2016. Pressure ulcers: developing clinical ındicators in evidence-based practice. a prospective study. Medical Archives 70(5), 379.

Turgut, N., Ak, A., Yakar, N., Yılmaz, B., Cora, B., Mıngır, T., Ali, İ., 2017. yoğun bakım hastalarında basınç ülseri sıklığı, önlenmesi ve tedavisi. Türk Yoğun Bakım Derneği Dergisi 15(2), 72–76.

Ullah,, N., Alam, I., 2012. Nutritional care of patients with pressure ulcers: Some evidence based guidelines. Pakistan Journal of Medical Sciences 28(1), 196-200

Ülker Efteli, E., Yapucu Günes, Ü., 2013. A prospective, descriptive study of risk factors related to pressure ulcer development among patients in intensive care units. Ostomy Wound Management. 59(7), 22–7.

Wanderwee, K., Grypdonck, M., Bacquer, D.D., DeFloor, T., 2009. The identification of older nursing home residents vulnerable for deterioration of grade 1 pressure ulcers. Journal of Clinical Nursing 18(21), 3050–3058.

Williams, D.F., Stotts, N.A., Nelson, K., 2001. Patients with existing pressure ulcers admitted to acute care. Journal of Wound Ostomy Continence Nursing 28 (1), 36.

MAKU J. Health Sci. Inst. 2022, 10(1): 79-90.
doi: 10.24998/maeusabed.1009489

Mehmet Akif Ersoy University
Journal of Health Sciences Institute
http://dergipark.gov.tr/maeusabed

Research Article / Araştırma Makalesi

Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability

Burdur'da IPARD Programı Kapsamında Bulunan Holştayn ve Simental İşletmelerinin Karlılık Bakımından Değerlendirilmesi

Hasan ASAN[1*], Mahiye ÖZÇELİK METİN[2]

[1*]Agriculture and Rural Development Support Institution Burdur Province Coordinatorship, Burdur, Turkey
[2]Burdur Mehmet Akif Ersoy University, Faculty of Veterinary Medicine, Department of Zootechnics, Burdur, Turkey

Abstract: In this study, In Burdur, two Holstein and two Simmental dairy cattle farms with IPARD (Instrument for Pre-Accession Assistance-Rural Development) support were evaluated in terms of profitability. In this context, the economic data records of the farms with 114 Holstein and 160 Simmental cows for 2019 constituted the material of the research. In the study, it was determined that the feed expenses (63.07%) took the first place in the proportional distribution of the cost elements that constitute the cost in the farms. The first line of income items of dairy cattle farms is milk income (70.26%). Within the scope of the research, financial profitability is 14.58%; economic profitability 0.10%; rantability factor 24.42%; expense/revenue ratio 1.11%; the cost of 1 kg milk was determined as 1.63 TL (0.29 $). As a result, it has been determined that these IPARD supported farms are profitable and sustainable.

Keywords: Cost, Holstein, Income, Profitability, Simmental.

Öz: Bu araştırmada, Burdur ilinde IPARD (Katılım Öncesi Yardım Aracı- Kırsal Kalkınma) desteği almış iki adet Holştayn ve iki adet Simental süt sığırcılık işletmesi, karlılık bakımından değerlendirilmiştir. Bu kapsamda, 114 baş Holştayn ve 160 baş Simental ırkı ineğin bulunduğu işletmelerin 2019 yılına ait ekonomik veri kayıtları araştırmanın materyalini oluşturmuştur. Yapılan çalışmada, işletmelerde maliyeti oluşturan masraf unsurlarının oransal dağılımında yem giderlerinin (%63,07) ilk sırayı aldığı tespit edilmiştir. Süt sığırcılık işletmelerinin gelir kalemlerinin ilk sırasında ise süt geliri (%70,26) yer almaktadır. Araştırma kapsamında mali rantabilite %14,58; ekonomik rantabilite %0,10; rantabilite faktörü %24,42; masraf/hasıla oranı %1,11; 1 kg süt maliyeti 1,63 TL (0,29 $) olarak tespit edilmiştir. Sonuç olarak, IPARD destekli bu işletmelerin karlı ve sürdürülebilir olduğu tespit edilmiştir.

Anahtar Kelimeler: Gelir, Holştayn, Karlılık, Masraf, Simental.

[*]Corresponding author : Hasan ASAN
e-mail : hasan.asan@tkdk.gov.tr
Geliş tarihi / Received : 14.10.2021
Kabul tarihi / Accepted: 04.04.2022

Introduction

IPARD (Instrument for Pre-Accession Assistance-Rural Development); it is the rural development component of IPA, which was created by the EU to support candidate and potential candidate countries. IPARD aims to support the harmonization preparations and policy development for the implementation and management of the EU's common agricultural policy, rural development policy and related policies. This program is implemented through the Agriculture and Rural Development Support Institution (ARDSI), which is the EU accredited institution.

In dairy cattle breeding, the yield is mainly on obtaining calves and milk. The fact that milk yield is at a certain level depends on the fertility. Therefore, profitability is directly related to the level of fertility and milk yield.

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

In recent years, the proportion of cultured cattle and hybrids has been increasing in Turkey. In parallel, the milk yield per animal is also increasing. This situation also contributes positively to the profitability of the enterprise.

Dairy cattle breeding requires long-term planning, taking into account income and expenses. Considering the expense, the investment in the period of construction, machinery, equipment and animal costs; in the period of production, feed, labor, veterinary-medicine, electric, water, insurance, maintenance and depreciation costs come to the fore. The income item, basically comes from the sale of milk. In addition, reformed cattle, calves, breeding animals and fertilizer sales and government incentives constitute other sources of income (Alyeşil and Özer, 2018).

Considering that the main purpose of dairy cattle breeding farms is the production of milk, the animals in the farm should be used as soon as possible for breeding, and then start production. The transition of dairy cattle to the period of yielding is important for the profitability of the farm (Akbaş, 2011).

For the development and profitability of livestock, enterprises should provide quality and inexpensive roughage feed. Considering that feed costs account for 60-70% of the total cost of dairy cattle breeding farms, the inclusion of quality roughage feed in the ration also reduces costs. Therefore, roughage feeds, which are more suitable for the nutritional physiology of animals than concentrate feed, should be met by dairy farms from meadows, pastures or by planting fodder plants. Lack of quality roughage feed; it causes high prices of animal products, low animal yields, and therefore people's insufficient intake of animal protein (Avcıoğlu et al., 2000).

Şahin et al. (2014) in their study "A Study on Ways to Increase Profitability in Cattle Breeding Farms in Iğdır Province"; A one-on-one survey was conducted on 233 cattle breeding farms located in Iğdır province and the data for 2012 were obtained and evaluated. According to the research result, it was found that feed costs accounted for 79.9% of the changing costs. This was followed by the foreign labor force with 11.8% healthcare with 4.7% electricity and water with 1.8% and other expenses with 1.8%.

Semerci et al. (2015) in the province of Hatay, it was aimed to evaluate the dairy cattle farms from the economic point of view. The data obtained from 141 dairy farms located in 24 settlements constituted the research material. As a result of the study, the average number of cattle in farms was found to be 11.04 head, the number of dairy cattle was 4.87 head, and the average milk yield per dairy cattle was 18.73 lt (liter). It was determined that 64.26% of the variable expenses and 35.74% of the fixed expenses had a share in the total expenses. Feed costs are in the first place with a share of 80.56% in total expenses, followed by 4.54% pharmaceuticals, 3.47% veterinarians, 3.04% repair and maintenance, 2.44% electricity, 1.73% water and cleaning materials, 1.65% infestation and seeding, 1.39% salt and litter, 0.86% insurance and 0.32% machine costs. The income elements in the examined farms consist of milk income, increase in fixed assets, fertilizer income and milk incentive income. The proportions of these in the total income are 82.98%; 11.03%; 3.82% and 2.17% respectively. The cost of 1 liter of milk was 0.94 TL. According to the research, financial rantability was determined as 6.05% and economic rantability was determined as 7.65%.

In the study conducted by Aşkan and Dağdemir (2016), 182 surveys were conducted in Erzurum, Erzincan and Bayburt provinces located in TRA1 Level 2 Region, 111, 57 and 14, respectively. It is aimed to calculate the cost of 1 kg (kilogram) of milk in dairy cattle breeding farms that benefit from incentives and supports provided by the state. As a result of the study, Bayburt, Erzincan, Erzurum and TRA1 average milk costs were found to be 0.616; 0.545; 0.600; 0.593 TL/kg with incentives and 0.877; 0.717; 0.859; 0.820 TL/kg without incentives, respectively. The highest share in production costs, respectively 67.69%; 74.97%; 71.29%; 72.67% with feed costs; second place, respectively, 15.86%; 10.32%; 12.86%; 12.13% permanent labor costs was formed.

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

In their study titled "Economic Analysis of Dairy Cattle Breeding Activity of Kazova Vasfi Diren Agricultural Farm", Alyeşil and Gözener (2018) used the accounting and business records of 2016 belonging to the livestock farm. As a result of the research; among the cost elements of the enterprise, 52.09% of the total costs are for feed expenses, 17.17% for labor costs, 12.63% for depreciation, 2.11% for medicine costs and 16.00% for other expenses conclusion has been reached. It was reported that the sources of income were milk income, male calf income, insurance damage income and support, which were 71.27%; 7.62%; 16.53% and 4.58% respectively. The income/expense ratio was 13.16% and the operating profit was 5.28%.

In this study; it is aimed to evaluate the profitability of Holstein and Simmental cattle breeds farms established within the scope of IPARD (Instrument for Pre-Accession Rural Development) Program in Burdur province.

Materials and Methods

Material

Supported by the Agriculture and Rural Development Support Institution with IPARD funds, Burdur Province; as of 31 December 2019, the economic data of the 2019 financial year of the 4 breeding cattle breeding enterprises in Altınyayla, Bucak, Karamanlı and Kemer districts constitute the material of the research. These dairy farms have 157 and 120 Holstein breed cattle, Simmental breed cattle 260 and 117 in each dairy farm.

Method

Obtaining Data

Within the scope of the research, the method of face-to-face interviews with farms owners was carried out for the provision of economic data. In addition, the accounting documents held by the farms have been examined. The obtained economic data were evaluated using the Microsoft Excel program.

Table 1 economic analysis table has been created to be used in obtaining economic data from farms and calculating the results of economic analysis (Murat, 2011).

Feed Expenses: The feed expenses of the enterprise are evaluated separately as roughage and concentrated feed. Purchased feeds were calculated at the purchase price, with the yard cost if the feeds produced by the enterprises themselves can be calculated, and in cases where it cannot be calculated, it was assumed that it was 80% of the market price. The yard cost was obtained by subtracting the estimated marketing costs from the market selling price of feed (Günlü, 1997).

Labor Expenses: Labor expenses have been evaluated separately as family labor and foreign labor. Payments to the foreign labor were calculated according to the statement of the owners of the farm or, in cases where this is not possible, on the minimum wage. In the family labor force, the age, gender and work of the family members who are actively involved in dairy cattle breeding are evaluated in terms of their work and calculated on the minimum wage after being converted into an adult male labor unit (Günlü, 1997).

Veterinary-Health Expenses: During the period when the farm was engaged in milk production activities, the costs of veterinary services, vaccines and medicines used, artificial insemination and disinfection were taken into account. These expense items were calculated based on the records kept at the farmor the statement of the owner of the farm (Günlü, 1997; Tandoğan, 2006).

Electricity and Water Expenses: The amounts of electricity and water used in the enterprise and the fee paid to these items were calculated by checking the bills of the relevant institutions (Murat, 2011).

Insurance Expenses: The insurance costs of the buildings and machinery equipment in the farm were evaluated by checking them over the said insurance policy (Murat, 2011).

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

Table 1. The table of economic analysis used for the calculation of operating results.

İnformations	Year (2019)	Rate (%)
Farm Number:		
Financial Date: 1 January-31 December 2019		
1. Feed Expenses		
2. Labor Expenses		
3. Veterinary-Health Expenses		
4 . Electricity and Water Expenses		
5. Insurance Expenses		
6. Credit Interest		
7. The Cost of Milk Given to Calves		
8. Other Expenses		
A. Total Expenses		
9. General Administrative Expenses		
10. Buildings		
a) Depreciation		
b) Maintenance and Repair Costs		
11. Machine-Equipment		
a) Depreciation		
b) Maintenance and Repair Costs		
12. Depreciation of Live Fixtures		
B. General Total of Expenses		
C. Total Secondary Income		
a) Calf Income		
b) Fertilizer Income		
c) Inventory Value Increase		
d) Fattening Cattle and Live Material Sales Income		
e) Incentive and Support Income		
D. Total Cost (B-C)		
E. Total Amount of Milk Produced (kg)		
a) 1 kg Milk Production Cost (D/E)		
F. Milk Sales Income		
G. Total Sales Income (C+F)		
H. Net Profit/Loss (G-D)		

Credit Interest: The interest of the credit used by the farm has been evaluated. At the same time, the statement of the farm owner was based on, and the related bank organization's interest rates were controlled and calculated (Günlü, 1997; Murat, 2011).

Inventory Value Change: Because depreciation is allocated to milking cows, calves and heifers older than 6 months of age have been evaluated for inventory value change. The end-of-year and beginning-of-year values of the calves and heifers in question were calculated, and animals under 6 months of age were included in the calf income. The following formula was used to calculate the inventory value change:

$$IVC = YHV + AVS + DAV - (YHV + AVP)$$

IVC= Inventory value change,
YHV= Year-end herd value,

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

AVS= Animal value sold,
DAV= Deceased animal value,
YHV= Year-begining herd value,
AVP= Animal value purchased.

If the result of the transaction is negative (-), it is evaluated as a 'Decrease in Inventory Value' and included in the expense elements, if it is positive (+), it is evaluated as an 'Increase in Inventory Value' and included in the elements of secondary income (Günlü, 1997).

The Cost of Milk Given to Calves: It was calculated by multiplying the amount of milk given to calves in the farm by the milk price in the relevant period (Murat, 2011).

Other Expenses: Fuel, transportation, mat, animal insurance, communication, stationery etc. expenses are included in this expense item (İçöz, 2004; Murat, 2011).

Total Expenses: It consists of feed, labor, veterinary-health, electricity-water, insurance, credit interest, milk costs for calves and other expenses (Aydın, 2011).

General Administrative Expenses: As a general administrative expense in dairy cattle breeding farms, 3% of sales revenues were received (Aydın, 2011).

Maintenance and Repair Costs: The statement of the owner of the farm was based on the calculation of maintenance and repair costs. In cases where this is not possible, a total of 3% of the acquisition costs of farm buildings were taken, including 1% maintenance and 2% repair (İçöz, 2004; Tandoğan, 2006; Murat, 2011).

Depreciation of Live Fixtures: It was obtained by dividing the difference between the breeding value of existing dairy cattle in the farm and the butchering value by the economic life (Murat, 2011).

Depreciation of Buildings and Equipment: It was obtained by subtracting the scrap value from the current acquisition value and dividing it by the economic life to calculate the depreciation of buildings and equipment in the farm (Murat, 2011).

General Total of Expenses: The total of expenses is composed of general administrative expenses, maintenance-repair expenses, building and equipment depreciation and living fixtures depreciation (Tandoğan, 2006; Aydın, 2011; Murat, 2011).

Milk Sales Income: Milk sales income, which is one of the main income elements of dairy cattle breeding farms, was calculated by multiplying the amount of milk by the milk price in the corresponding period (Tandoğan, 2006).

Secondary Income: Calf income, fertilizer income, inventory value increase, incentive and support income, income from the sale of fattening cattle and live materials, which is the main income element in dairy cattle farms, is income from calves other than milk sales income. Calf income was obtained by multiplying the number of calves younger than 6 months of age by the market price in the region where the farm is located (Aras and Izmirli 1976; Tandoğan, 2006).

Total Revenues: It consists of the sum of milk sales revenue and additinional revenues (Murat, 2011).

Total Cost: Obtained by subtracting secondary revenues from the general total of expenses. The production cost of 1 kg of milk was found by dividing the obtained value by the total amount of milk produced (Tandoğan, 2006; Aydın, 2011; Murat, 2011).

Net Profit/Loss: It is obtained by subtracting the total cost from the total income (Aydın, 2011).

Determination of Operating Capital Structures

Using the data obtained as a result of face-to-face meetings and checking accounting documents, the method given in Table 2 was used (Açıl, 1970).

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

According to Table 2, it can be seen that the working capital consists of active, passive and equity capital.

Table 2. Operating capital inventory.

Type of Capital	2019/TL
I. Active Capital	
A. Real Estate Capital	
B. Working Capital	
1. Animal Capital	
2. Equipment Capital	
3. Material Capital	
4. Cash-Bank Assets	
II. Passive Capital	
III. Equity Capital (I-II)	

Active Capital: Consists of real estate capital and working capital.

Real Estate Capital: The barn, feed warehouse, milking parlor, manure pit, silage pit etc. used in the production flow in dairy cattle farms, consists of the sum of the acquisition costs of the buildings.

Working Capital: Consists of animal capital, equipment capital, material capital and cashier-bank capital.

Animal Capital: The total monetary value of all the animals in the dairy cattle farms.

Equipment Capital: Consists of the total cost of all machinery and equipment used in the dairy cattle breeding farm.

Material Capital: It is the capital used for the purchase of feed, medicines, vaccines, disinfectants, cleaning agents, fuel oil consumed at the farm during the production of milk.

Cash-Bank Assets: It refers to the cash in the bank or safe in order to cover the expenses elements.

Passive Capital: It refers to all debts of farms to banks, cooperatives, individuals, institutions and organizations.

Equity Capital: The difference between active capital and passive capital. It shows the farm's own resources.

Profitability Analysis

By transferring and evaluating the obtained data to the Microsoft Excel program, the input/output values and profitability ratios of farms were calculated as follows:

Financial Rantability: This value, which is considered a measure of success, is the degree of efficiency of equity capital. The net profit obtained in the same period is expressed as the ratio of the equity capital in the same period (Sakarya and Günlü, 1996).

Economic Rantability: It is an indicator of how effectively, efficiently and profitably economic resources are used throughout production. It was found that the net profit obtained and the amount of passive capital were divided by the active capital (Günlü, 1997).

Rantability Factor: It is expressed as the ratio of the net product of the enterprise to its gross product (Günlü, 1997).

Expense/Revenue Ratio (output/input): It is expressed as the ratio of the total sales revenues obtained in a certain period to the general total of expenses. The fact that this ratio is greater than 1 indicates that the farm is working profitably, and the fact that it is less than 1 indicates that the farm is losing (Aydın, 2011).

Results

Farm Expenses

The scope of the research, the cost elements that comprise the operating costs of feed, labor, veterinary-medical, electric-water, insurance, credit interest, calves given milk, other costs, general administration, maintenance and depreciation costs. The proportional distribution of the costs that make up the operating cost is given in Table 3.

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

Table 3. The proportional distribution of the elements of expenses in farms (%).

Elements of Expenses	The Average of All Farms	1. Holstein Farm	2. Holstein Farm	1. Simmental Farm	2. Simmental Farm
Feed	63.07	68.52	57.31	57.03	69.42
Labor	4.77	5.08	3.49	6.36	4.13
Veterinary-Health	2.57	1.85	1.94	4.42	2.07
Electricity and Water	5.22	2.31	11.64	4.15	2.79
Insurance	0.24	0.31	0.23	0.41	0.00
Credit Interest	3.23	4.04	3.56	5.30	0.00
The Cost of Milk Given to Calves	1.82	1.48	1.99	1.44	2.36
Other	3.10	2.31	5.82	2.21	2.07
General Administrative	2.52	2.58	2.58	2.44	2.49
Depreciation	8.11	6.36	6.93	10.29	8.87
Maintenance and Repair	5.36	5.16	4.51	5.94	5.81

When Table 3 is examined, it is seen that the most important cost factor that creates the cost is feed input. The share of the feed expense ratio of the farms in all expenses was 63.07%. This was followed by depreciation, maintenance-repair, electricity-water, labor, credit interest, other expenses, veterinary-health, general administration, milk given to calves and insurance, respectively. In addition, the farms with the highest and lowest feed costs are the 2nd Simmental farm and the 1st Simmental farm, respectively.

Table 4. Proportional distribution of income elements in farms (%).

Elements of Income	The Average of All Farms	1. Holstein Farm	2. Holstein Farm	1. Simmental Farm	2. Simmental Farm
Milk Income	70.26	63.90	66.46	84.21	66.48
Calf Income	6.16	4.09	3.48	9.40	7.67
Fertilizer İncome	0.10	0.00	0.00	0.39	0.00
Inventory Value Increase	0.82	0.92	0.73	0.71	0.92
Fattening Cattle and Live Material Sales Income	17.20	23.72	24.39	0.00	20.71
Incentive and Support Income	5.45	7.37	4.94	5.29	4.22

Farm Income

The income elements of the farms included in the study consist of milk income, calf income, fertilizer income, inventory value increase, fattening cattle and live material sales income, incentive and support income elements. The proportional distribution of farm income is given in Table 4.

Milk income, which is the main income element of dairy cattle farms, ranks first with a share of

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

70.26% in all incomes in this research. This is followed by fattening cattle and live material sales, calf income, incentive and support income, inventory value increase and fertilizer income, respectively. Among the incomes, the farms with the highest and lowest milk income ratios are the 1st Simmental farm and the 2nd Simmental farm, respectively (Table 4).

Profitability Analysis and Cost

In order to evaluate and interpret the economic performance of the farms examined within the scope of the research, profitability ratios, expense/revenue ratio and 1 kg milk cost are calculated and given in Table 5.

According to Table 5, the financial rantability, economic rantability and rantability factor ratios of farms were found to be 14.58%; 0.10 and 24.22 respectively. It is seen that the expense/revenue ratio is 1.11% the cost of 1 kg milk was calculated as 1.63 TL (0.29 US Dollars). Farms where the cost of milk 1 kg is the highest and the lowest, 1st Holstein farm and 1st Simmental farm respectively.

Table 5. Profitability rations of farms (%), expense/revenue ratio (%) and cost of 1 kg milk (TL, US Dollars).

Economic Indicators	The Average of All Farms	1. Holstein Farm	2. Holstein Farm	1. Simmental Farm	2. Simmental Farm
Profitability Rations					
Financial Rantability	14.58	14.93	18.60	10.01	14.76
Economic Rantability	0.10	0.08	0.11	0.11	0.09
Rantability Factor	24.42	17.80	22.79	30.87	26.21
Expense/Revenue Ratio	1.11	1.04	1.11	1.18	1.12
1 kg Milk Production Cost	1.63 (0.29 $)	1.77	1.61	1.56	1.59

Discussion

Farm Expenses

The scope of the research, the cost elements that comprise the farm costs of feed, labor, veterinary-medical, electric-water, insurance, credit interest, calves given milk, other costs, general administration, maintenance and depreciation costs. In this study, in accordance with the economic data for 2019, operating inputs were calculated.

It was seen that feed expenses (63.07%) take the first place among the cost elements that make up the cost. Similarly, the most studies reported that feed costs take place on the top in all costs (Günlü, 1997; Uyanık, 2000; Günlü et al., 2001; Şahin, 2001; Şahin et al., 2001; Karakaş Oğuz et al., 2011; Murat, 2011; Aşkan and Dağdemir, 2016; Algreen and Gözener, 2018. In addition, this value (63.07%) has been found similar to the results of studies conducted by Turkyilmaz and Aral (2002); higher than the results of the study conducted by Günlü (1997), Uyanık (2000), İçöz (2004), Karakaş Oğuz et al. (2011), Alyeşil and Gözener (2018); lower than the results of the study conducted by Şahin (2001), Şahin et al. (2001), Yılmaz et al. (2003), Nizam and Armağan (2006), Tokmak et al. (2011), Şahin et al. (2014), Semerci et al. (2015). Although some of the roughage and concentrate feed required for the enterprise is produced by the farms, the high share of the feed expenses in the total expenses suggests that the animals in the farms do not go to the pasture. Demir et al. (2014) in the Kars Region, it was reported that the share of feed farms in total expenses, depending on the use of pastures and meadows, is 25%. Demir et al. (2014)' s result shows the importance of pasture and pasture use in terms of livestock input costs.

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

The share of labor expenses (4.77%) in total expenses; other studies (Günlü, 1997; Uyanık, 2000; Günlü et al., 2001; İçöz, 2004; Karakaş Oğuz et al., 2011; Demir et al., 2014; Aşkan and Dağdemir, 2016; Alyeşil and Gözener, 2018), it was seen that it turned out to be low compared to. In this study, the low cost of labor can be explained by the fact that the scale of the enterprise is large, the level of mechanization and technology of the farms are high modern enterprises, and the architectural structures of the farms are suitable for functioning. For these reasons, it can be said that the high productivity due to the labor force reduces labor costs.

The share of veterinary-health expenditures in total costs was found to be 2.57% on average. It was found that this value was low when compared with similar studies (Günlü, 1997; Günlü et al., 2001; İçöz, 2004; Nizam and Armağan, 2006; Karakaş Oğuz et al., 2011; Tokmak et al., 2011; Demir et al., 2014; Semerci et al., 2015). The low level of this value can be explained by the high level of education of farm owners, the implementation of preventive medicine practices at farms, the high standards of animal welfare of farms, the good conditions for care-feeding-breeding.

The share of electricity and water expenses in total expenses was determined as 5.22% on average. This value was found to be higher than the results of the study by Şahin (2001), Karakaş Oğuz et al. (2011), Murat (2011), Şahin et al. (2014), Semerci et al. (2015). It is thought that this situation is caused by the high level of machinery and technology of farms in general. In addition, all farms store their own milk in milk storage tanks after passing it through the pre-cooling system, which increases the cost of electricity.

The share of insurance expenses in total expenses was determined as 0.24% on average. This result found is lower than the reports of Uyanık (2000), Karakaş Oğuz et al. (2011), Semerci et al. (2015); it is higher than the declaration of Murat (2011).

The share of credit interest expenses in total expenses was determined as 3.23% on average. This value is higher than the study results of Uyanık (2000), İçöz (2004), Murat (2011); It was found lower than the study results of Karakaş Oğuz et al. (2011), Demir et al. (2014).

It was determined that the cost of milk given to the calves is 1.82% in total costs. This result was found to be lower than the results of the study conducted by Karakaş Oğuz et al. (2011) and Murat (2011).

It was determined that the share of depreciation expenses in total expenses was 8.11% on average. This value was found to be close to what Tandoğan (2006) and Murat (2011) reported; higher than the values reported by Günlü (1997), Günlü et al. (2001), Türkyılmaz and Aral (2002), İçöz (2004) and lower than the values reported by Alyeşil and Gözener (2018).

The share of maintenance-repair expenses in total expenses was determined as 5.36% on average. It was observed that this result was higher than the results of the studies conducted by Günlü (1997), Uyanık (2000), İçöz (2004), Tandoğan (2006), Karakaş et al. (2011), Murat (2011), Tokmak et al. (2011), Demir et al. (2014), Semerci et al. (2015). It is thought that the value found in this study is high due to the fact that the buildings are high-cost structures since they are made of steel and reinforced concrete, the machinery-equipment is modern and technological tools, and the depreciation of live fixtures is added to the depreciation account.

Farm Income

In the study, the income elements of the farms were determined as milk income, calf income, fertilizer income, inventory value increase, fattening cattle and live material sales income and incentive and support income. in accordance with the economic data for 2019, operating revenues were calculated.

In the dairy cattle farms where the study was conducted, it was determined that the average milk income (70.26%) was the income item with the highest rate among all income items. This result

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

was found to be high according to the results of the study conducted by Günlü (1997), Uyanık (2000), Günlü et al. (2001), Şahin et al. (2001), Türkyılmaz and Aral (2002), İçöz (2004), Nizam and Armağan (2006), Tandoğan (2006) and low according to the results of the study conducted by Murat (2011), Semerci et al. (2015), Alyeşil and Gözener (2018). It is seen that milk income takes the first place among the elements that make up the income items of dairy cattle farms. This is supported by similar studies (Günlü, 1997; Uyanık, 2000; Günlü et al., 2001; Şahin et al., 2001; Türkyılmaz and Aral, 2002; İçöz, 2004; Nizam and Armağan, 2006; Tandoğan, 2006; Murat, 2011; Semerci et al., 2015).

It was concluded that calf income has an average of 6.16% share among farms income items. This result was found to be consistent with what Tandoğan (2006) and Murat (2011) reported. On the other hand, while it was higher than the results of the study by Uyanık (2000), it was found to be lower than the results of the study by Günlü et al. (2001), Türkyılmaz and Aral (2002), İçöz (2004), Karakaş Oğuz et al. (2011). In this study, it was observed that the calf income was higher in the simmental farms than in the holstein farms (Table 4).

The share of fertilizer income among operating income items was determined as 0.10% on average. It was found that this value is lower than the results of the study conducted by Günlü (1997), Şahin (2001), Uyanık (2000), Türkyılmaz and Aral (2002), İçöz (2004), Nizam and Armağan (2006), Karakaş Oğuz et al. (2011), Semerci et al. (2015). In this study, it was determined that only one of the four farms included in the scope of the study receives income from the sale of fertilizers, while the other farms use farm fertilizer to improve the soil. Therefore, the fertilizer income ratio was found to be low compared to similar studies.

It was determined that the increase in inventory value has an average of 0.82% share in income items. This value was found to be low when compared to the values reported by Günlü (1997), Günlü et al. (2001), Türkyılmaz and Aral (2002), İçöz (2004), Tandoğan (2006).

It was found that the income from the sale of fattening cattle and live materials has an average share of 17.20% within the income items. The income from the sale of fattening cattle and live materials, meat income from male cattle that have reached the time of slaughter, and the sale of breeding heifers have been evaluated. When the literature was examined, it was seen that the result of the study conducted by Karakaş Oğuz et al. (2011) was lower than the value found in this study.

It was determied that the incentive and support income has an average share of 5.45% within the income items. It was found that this result was close to the result reported by Karakaş Oğuz et al. (2011) and higher than that reported by Semerci et al. (2015).

Profitability Analysis and Cost

In order to evaluate and interpret the economic performance of the farms examined within the scope of the study, profitability ratios, expense/revenue ratio and 1 kg milk cost were calculated.

In the study, the financial rantability ratio of farms was determined as 14.58% on average. It was found that this result was close to the results found by Günlü et al. (2001) and İçöz (2004). In addition, it was determined that this result was higher than the research results reported by Uyanık (2000), Tandoğan (2006), Karakaş Oğuz et al. (2011), Murat (2011), Tokmak et al. (2011), Semerci et al. (2015) and lower than the research result reported by Türkyılmaz and Aral (2002). The financial rantability ratio can be considered as an indicator of what remains of the profit from the farm that arises after deducting taxes and interest. The higher it is for the farm, the better in terms of profitability. If it is negative, it is considered as an indication that the farms is making a loss (Karakaş Oğuz et al., 2011). In the study, the financial rantability rate was determined as 14.93% in the 1st Holstein farm, 18.60% in the 2nd Holstein

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

farm; 10.01% in the 1st Simmental farm, 14.76% in the 2nd Simmental farm. According to this, while the profitability of the farm is the 2nd Holstein farm; the lowest is the 1st Simmental farm. In addition, the fact that financial rantability is higher than economic rantatability can be evaluated as a more effective and efficient use of equity capital. Accordingly, it was the 2nd Holstein farm that used its equity capital more effectively and achieved higher profitability.

The economic rantability rate of farms was determined as 0.10% on average. This ratio was found to be higher than that reported by Uyanık (2000) and Tandoğan (2006), and lower than that reported by Günlü et al. (2001), İçöz (2004), Karakaş Oğuz et al. (2011), Murat (2011), Tokmak et al. (2011), Semerci et al. (2015). Economic rantability is the total capital of farms and is an indicator of the ratio at which the sum of resources makes a profit. The profitability of resources is directly proportional to the high output of this ratio (Karakaş Oğuz et al., 2011). In the study, the economic rantability rate was determined as 0.08% in the 1st Holstein farm, 0.11% in the 2nd Holstein farm; 0.11% in the 1st Simmental farm, 0.09% in the 2nd Simmental farm.

Another ration determined within the scope of the research is the rantability factor. The rantability factor of farms was found to be 24.42% on average. While this value is higher than some research findings (Günlü, 1997; Uyanık, 2000; Türkyılmaz and Aral, 2002; Tandoğan, 2006; Murat, 2011; Karakaş Oğuz et al., 2011), it is lower than a research finding (İçöz, 2004).

In the research, the rantability factor rate was determined as 17.80% in the 1st Holstein farm, 22.79% in the 2nd Holstein farm; 30.87% in the 1st Simmental farm, 26.21% in the 2nd Simmental farm. The rantability factor found is higher in Simental farms than in Holstein farms.

The expense/revenue ratio was determined as an average of 1.11%. This value; higher than the value found by Tandoğan (2006); close to the values found by the İçöz (2004) and Murat (2011); It was found to be lower than the values found by Türkyılmaz and Aral (2002) and Karakaş Oğuz et al. (2011). In the research, the expense/revenue ratio rate was determined as 1.04% in the 1st Holstein farm, 1.11% in the 2nd Holstein farm; 1.18% in the 1st Simmental farm, 1.12% in the 2nd Simmental farm. It can be seen that the values found are close to each other in all farms.

As in all enterprises, the main purpose of dairy cattle enterprises is to make profit. For a sustainable and profitable farms, minimizing the costs and thus reducing the milk production cost as much as possible is an important situation in terms of profitability. In the study, the average cost of 1 kg of milk was 1.63 TL ($ 0.29), in market conditions where the average selling price of milk in 2019 was 1.90 TL. In some studies conducted on the subject, the cost of 1 liter of milk was Nizam and Armağan (2006) 0.571 TL, İkikat Tümer and Birinci (2011) 0.35 TL, Karakaş Oğuz et al. (2011) 0.65 TL, Murat (2011) 0.495 TL, Semerci et al. (2015) 0.94 TL, Demir et al. (2014) reported it as 0.70 TL. In the study, the cost of 1 kg of milk was found to be close to each other in all four farms studied (Table 5).

As a result of the research, all farms were found profitable. Because the profitability ratios (financial rantability, economic rantability, rantability factor) are all positive values.

References

Açıl, A.F., 1970. Zirai ekonomi ve işletmecilik dersleri. Ankara Üniversitesi Ziraat Fakültesi, Yayın No:465, Ankara.

Alyeşil, H., Gözener, B., 2018. Kazova Vasfi Diren Tarım İşletmesi süt sığırcılığı faaliyetinin ekonomik analizi. Gaziosmanpaşa Bilimsel Araştırma Dergisi 7 (1), 87-100.

Akbaş, Y., 2011. Süt sığırcılığında karlılığı etkileyen faktörler. Uluslararası Bitkisel ve Hayvancılık Dergisi (Tarım Günlüğü) 2, 68-76.

Aras, A., İzmirli, R., 1976. İzmir şehir yöresinde ahır sütçülüğü yapan, ihtisaslaşmış süt işletmelerinden seçilen bir grubun ekonomik yönden incelenmesi ve üretim maliyeti. Ege Üniversitesi Ziraat Fakültesi yayın no: 279, Ege Üniversitesi Matbaası, İzmir.

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

Aşkan, E., Dağdemir, V., 2016. TRA1 düzey 2 bölgesinde destek ve teşvik alan süt sığırcılığı işletmelerinde süt üretim maliyeti ve karlılık durumu. Tarım Ekonomisi Araştırmaları Dergisi 2 (1), 1-12.

Avcıoğlu, R., Soya, H., Açıkgöz, E., Tan, A., 2000. Yem bitkileri üretimi. Türkiye Ziraat Mühendisliği V. Teknik Kongresi, 17-21.01.2000 Milli Kütüphane-Ankara, 1. Cilt, 567-585.

Aydın, E., 2011. Kars ve Erzurum illeri sığır besi işletmelerinin ekonomik analizi. Doktora Tezi, Ankara Üniversitesi Sağlık Bilimleri Enstitüsü, Ankara.

Demir, P., Aral, Y., Sarıözkan, S., 2014. Kars ili süt sığırcılık işletmelerinin sosyo-ekonomik yapısı ve üretim maliyetleri. Yüzüncü Yıl Üniversitesi Veteriner Fakultesi Dergisi 25 (1), 1-6.

Günlü, A., 1997. Konya ili süt sığırcılık işletmelerinde karlılık ve verimlilik analizleri ile işletmelerin üretim ve pazarlama sorunları. Doktora Tezi, Ankara Üniversitesi Sağlık Bilimleri Enstitüsü, Ankara.

Günlü, A., İmik, H., Tekerli, M., 2001. Afyon ili süt sığırcılık işletmelerinin genel özellikleri ile karlılık ve verimlilik analizleri. Lalahan Hayvancılık Araştırma Dergisi 41 (1), 1-12.

İçöz, Y., 2004. Bursa ili süt sığırcılık işletmelerinin karlılık ve verimlilik analizi. Uzmanlık Tezi, Ankara.

İkikat, Tümer, E., Birinci, A., 2011. Hayvancılık işletmelerinde süt maliyetine etki eden faktörlerin analizi: Tokat ili örneği. Atatürk Üniversitesi Ziraat Fakültesi Dergisi 42 (1), 35-39.

Karakaş Oğuz F., Oğuz N., Sipahi C., Çiçek M., 2011. Süt üretiminde maliyet, durum tespiti ve eğitim faaliyeti.
https://www.baka.gov.tr/assets/upload/dosyalar/15706067596155747935 9BurdurSuturetimindeMaliyetDurumTespitiveEgitimFaaliyetleri.pdf (Erişim Tarihi: 16/07/2019).

Murat, H., 2011. Ege ve Orta Anadolu bölgesi damızlık sığır yetiştirici birliklerine bağlı süt sığırcılık işletmelerinin ekonomik analizi. Doktora Tezi, Ankara Üniversitesi Sağlık Bilimleri Enstitüsü, Ankara.

Nizam, S., Armağan, G., 2006. Aydın ilinde pazara yönelik süt sığırcılığı işletmelerinin verimliliklerinin belirlenmesi. Adnan Menderes Üniversitesi Ziraat Fakültesi Dergisi 3 (2), 53-60.

Sakarya, E., Günlü, A., 1996. Limuzin x Jersey (F1) melezi ve holştayn ırkı tosunlarda optimal besi süresinin tespiti üzerine bir araştırma. Ankara Üniversitesi Veteriner Fakültesi Dergisi 43, 113-120.

Semerci, A., Parlakay, O., Duran, Çelik, A., 2015. Süt sığırcılığı yapan işletmelerin ekonomik analizi: Hatay ili örneği. Namık Kemal Üniversitesi Tekirdağ Ziraat Fakültesi Dergisi 12 (3), 8-17.

Şahin, K., 2001. Kayseri ilinde süt sığırcılığı yapan işletmelerin yapısal özellikleri ve pazarlama sorunları. Yüzüncü Yıl Üniversitesi Ziraat Fakültesi Tarım Bilimleri Dergisi 11 (1), 79-86.

Şahin, K., Gül, A., Koç, B., Dağıstan, E., 2001. Adana ilinde entansif süt sığırcılığı üretim ekonomisi. Yüzüncü Yıl Üniversitesi Ziraat Fakültesi Tarım Bilimleri Dergisi 11 (2), 19-28.

Şahin, K., Ertürk, Y.E., Karadaş, K., Yılmaz, İ., 2014. Iğdır ilinde büyükbaş hayvancılık işletmelerine karlılığı artırma yolları üzerine bir araştırma. XI. Ulusal Tarım Ekonomisi Kongresi, Samsun, 641-645.

Tandoğan, M., 2006. Afyonkarahisar ili süt sığırcılığı işletmelerinde karlılık analizi ile işletmelerde karşılaşılan üretim ve pazarlama sorunları. Yüksek Lisans Tezi, Afyon Kocatepe Üniversitesi Sağlık Bilimleri Enstitüsü, Afyon.

Tokmak, T., Ünalan, A., Çiçek, R., 2011. Niğde ili süt sığırcılığı işletmelerinin ekonomik analizi. 7. Ulusal Zootekni Bilim Kongresi, Adana, 118-131.

Türkyılmaz, M.K., Aral, S., 2002. Aydın ili süt sığırcılık işletmelerinde kaynak kullanımında etkinlik derecesi ile örgütlenme ve pazarlama sorunları. Kafkas Üniversitesi Veteteriner Fakültesi. Dergisi 8 (1), 41-48.

Uyanık, S., 2000. Burdur ili süt sığırcılık işletmelerinde karlılık ve verimlilik analizleri. Doktora Tezi, Ankara Üniversitesi Sağlık Bilimleri Enstitüsü, Ankara.

Yılmaz, İ., Dağıstan, E., Koç, B., Özel, R., 2003. Hatay ilinde projeli ve projesiz süt sığırcılığı yapan işletmelerin süt sığırcılığı üretim faaliyetlerinin ve faktör verimliliklerinin analizi. Akdeniz Üniversitesi Ziraat Fakültesi Dergisi 16 (2), 169-178.

To cite this article: ASAN H,, ÖZÇELİK METİN M. (2022). Evaluation of Holstein and Simental Farms in Burdur under the IPARD Program in terms of Profitability. MAKU J. Health Sci. Inst., 10(1), 79-90.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

MAKU J. Health Sci. Inst. 2022, 10(1): 91-99.
doi: 10.24998/maeusabed.1089779

Mehmet Akif Ersoy University
Journal of Health Sciences Institute
http://dergipark.gov.tr/maeusabed

Research Article / Araştırma Makalesi

Determination of Virulence Factors in Candida albicans Isolated from Cattles with Mastitis

Mastitisli İneklerden İzole Edilen Candida albicans İzolatlarında Virülens Faktörlerinin Belirlenmesi

Orçun SAV[1], Dilek ÖZTÜRK[2*]

[1]Veterinarian, Antalya, Turkey
[2]Burdur Mehmet Akif Ersoy University, Faculty of Veterinary Medicine, Department of Microbiology, Burdur, Turkey

Abstract: In recent years, the importance of yeast in bovine mastitis etiology is increasing. The aim of this study was to determine the prevalence of *Candida albicans* in milk samples collected from cows with mastitis, to identify the phenotypic and genotypic methods and to determine the virulence factors. According to the results of the surveys, 686 milk samples were collected from 178 cows with mastitis problems from 20 dairy cattle farms. Forty nine yeast isolates were obtained from these samples. Five isolates were identified as *C. albicans* with phenotypic tests (germ tube test, chlamydospor formation, chromogenic medium and reproduction at 45°C). Five isolates identified as C. albicans by phenotypic tests were confirmed by PCR using specific primers for detection CALB1 gene. It was determined that 2 (40%) of the *C. albicans* isolates had *ALS*1 and *PLB*1, 1 (20%) had *ALS*1 and 1 (20%) had *PLB*1 genes and no gene was found in 1 (20%) isolate. When the biofilm formation properties of *C. albicans* isolates were examined by tube adherence method, it was determined that 3 (60%) isolates were strong positive, 1 (20%) was weak and 1 (20%) isolate was negative. In conclusion, *C. albicans* isolates which were isolated from cows with mastitis had *ALS*1 and *PLB*1 genes and biofilm formation.

Keywords: *Candida albicans*, Mastitis, Virulence genes.

Öz: Son yıllarda sığır mastitis etiyolojisinde mayaların önemi giderek artmaktadır. Bu çalışmada mastitisli ineklerden toplanan süt örneklerinde *Candida albicans*'ın neden olduğu mastitis prevalansının belirlenmesi, *C. albicans*'ın fenotipik ve genotipik yöntemlerle identifikasyonu ve virülens faktörlerinin saptanması amaçlandı. Bu amaçla anket sonuçlarına göre mastitis problemi bulunan 20 süt sığırı işletmesinden 178 inekten 686 süt örneği toplandı. Bu örneklerden 49 maya izolatı elde edildi. Fenotipik testlerle (germ tüp testi, klamidospor oluşumu, kromojenik besiyerinde ve 45°C'de üreme) 5 izolat *Candida albicans* olarak identifiye edildi. Fenotipik testlerle *C. albicans* olduğu saptanan 5 izolat, *C. albicans* CALB1 genine spesifik primerler kullanılarak yapılan PZR ile doğrulandı. *C. albicans* izolatlarında adhezyondan (*ALS*1) ve fosfalipaz (*PLB*1) üretiminden sorumlu virülens genleri araştırıldı. İzolatların 2 (%40)'sinde *ALS*1 ve *PLB*1, 1 (%20)'inde *ALS*1 ve 1 (%20)'inde *PLB*1 genleri saptanırken, 1(%20) izolatta her iki genin de bulunmadığı belirlendi. *C. albicans* izolatlarının tüp adherens yöntemiyle biyofilm oluşturma özellikleri incelendiğinde 3 (%60) izolatın güçlü pozitif, 1 (%20) izolatın zayıf ve 1 (%20) izolatın ise negatif olduğu belirlendi. Sonuç olarak, bu çalışma ile mastitisli ineklerden izole edilen *C. albicans* izolatlarında önemli virülens genleri olan *ALS*1 ve *PLB*1 genleri ve biyofilm oluşumu belirlendi.

Anahtar Kelimeler: *Candida albicans*, Mastitis, Virülens genleri.

*Corresponding author : Dilek ÖZTÜRK e-mail : dozturk@mehmetakif.edu.tr
Geliş tarihi / Received : 18.03.2022 Kabul tarihi / Accepted: 26.04.2022

Introduction

Mastitis is the most prevalant and economically important problem of dairy cattle in the worldwide (Eldesouky et al., 2016). A wide variety of microorganisms including bacterial and fungal agents have been found as causative agents of

To cite this article: SAV O, ÖZTÜRK D. (2022). Determination of Virulence Factors in Candida albicans Isolated from Cattles with Mastitis. MAKU J. Health Sci. Inst., 10(1), 91-99.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

bovine mastitis (Erbaş et al., 2017). Although mycotic mastitis is less common in cattle compared to bacterial infections, *Candida* species are usually isolated from these cases. *Candida albicans (C. albicans)* is the most frequently isolated *Candida* species (Costa et al., 1993; Şeker and Özenç, 2011; Pachauri et al., 2013). Machine or manual milking of contaminated milk, indiscriminate and frequent use of antibiotics by animal owners and veterinarians, intramammary administration of contaminated antibiotics, cannulas and injectors cause yeast infections (Dworecka-Kaszak et al., 2012). *C. albicans* and its' spores are also important for public health as they can resist pasteurization heat (Schmitt, 1971; Tarfarosh and Purohit, 2008).

C. albicans is identified by conventional methods and biochemical tests, but these tests may take a long time from days to weeks. Furthermore, identification by phenotypic tests may sometimes fail to identification of *C. albicans* (Tarini et al., 2010). Molecular detection, especially Polymerase chain reaction (PCR) is rapid, sensitive and specific on detection of fungal DNA sequences (Pincus et al., 2007). *C. albicans* has several virulence factors that appear critical for pathogenicity such as adhesion and hydrolytic enzymes secretion. Phospholipase B1 (*PLB*1) is considered as one of important virulence factors and phosphalipases damage the cell membrane by hydrolyzing membrane lipids. So far, it has been reported that only *PLB*1 is detected in animal candidiasis cases (Novarro-Garcia et al., 2001; Eldesouky et al., 2016; Mousa et al 2016). Agglutinin-like Seguence (ALS) protein encodes large cell surface glycoproteins in *C. albicans* and provides adhesion to host surfaces. Upto date, nine ALS proteins have been identified in *C. albicans* isolates (Hoyer, 2001).

The aim of this study was to determine the prevalence of *C. albicans* in dairy cattle herds and to detect virulence genes of *C. albicans* isolated from bovine mastitis.

Materials and Methods

Samples

This study was conducted between August 2017 and June 2018 in dairy cattle farms in Burdur province of Turkey. Firstly, a questionnaire including questions about whether there was mastitis problem or not, treatment, antibiotics used, or not were made by owner. Enterprises with mastitis problems were selected to the study according to the results of the survey. The herd sizes were ranged from 13 to 60 animals. A total of 686 milk samples were taken from 178 cows in 20 different farms (Table 1).

This research was carried out with the approval of Mehmet Akif Ersoy University, Research Animal Local Ethics Committee (MAKÜ-HADYEK / 2017-315).

Milk samples were collected from cattle herds with clinical and subclinical mastitis problems. Before taking the milk sample, teat ends were cleaned and wiped using 70% alcohol. After the first few drops were thawed and discharged, 10 ml of the milk samples were taken into separate sterile tubes and send to Burdur Mehmet Akif Ersoy University Faculty of Veterinary Medicine, Department of Microbiology Laboratories.

Isolation and Identification of Candida albicans

Milk samples were cultured in Sabouraud Dextrose Agar (SDA) (Oxoid, Hampshire, UK) were suplemented with containing chloramphenicol (Oxoid, Hampshire, UK) and Blood agar (Merck, Germany) with 7% sheep blood. Petri dishes were incubated at 25°C for 24-72 hours aerobically Yeast identification were conducted by conventional methods such as Gram staining, germ tube, chlamydospor formation, reproduction at 45 °C and chromogenic medium (Quinn et al., 2011; Arda, 2015).

Germ Tube Formation

To cite this article: SAV O, ÖZTÜRK D. (2022). Determination of Virulence Factors in Candida albicans Isolated from Cattles with Mastitis. MAKU J. Health Sci. Inst., 10(1), 91-99.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

The first test used in identification of *Candida* species is germ tube . Each isolate was inoculated into a tube containing 1ml human serum and incubated at 37°C for 2 hours. One drop of suspension was placed to slide. Hyphae like extentions were accepted to be positive for germ tube formation at the microscopic examination (Quinn et al., 2011).

Table 1. Number of samples and enterprises.

Farm No	Location	Number of Animals	Number of Samples	Herd Size
1	Kayaaltı	7	27	45
2	Kayaaltı	4	15	21
3	Kayaaltı	7	27	30
4	Suludere	10	38	27
5	Suludere	10	40	24
6	Çine	10	38	32
7	Kuruçay	9	35	17
8	Düğer	11	42	55
9	Taşkapı	11	44	40
10	Taşkapı	8	30	20
11	Ardıçlı	7	26	30
12	Askeriye	6	22	23
13	Akyaka	10	38	48
14	Centrum	10	40	13
15	Yazıköy	10	39	32
16	Yazıköy	10	36	35
17	Yazıköy	9	35	60
18	Yazıköy	11	42	33
19	Yazıköy	8	32	25
20	Kemer	10	40	59
Total		**178**	**686**	**669**

Chlamydospor Formation

Chlamydospore formation test was performed on Corn Meal agar (Oxoid, Hamshire, UK) suplemented with Tween 80 (Merck, Merck Millipore Corporation, Almanya). According to this, a loop yeast colony was pierced to medium at a point of about 30 degrees, pressed to the bottom of the medium and pushed forward in a line and withdrew. The lines are covered with coverslip and petri dishes were incubated at 26 ºC for 72 h aerobically The petri dishes were examined at magnification for 10x ve 40x by light microscopy. Detection of big, thin wall and round, and hyphae blastospores at the junction of chlamydospores which were evaluated to be positive for *C. albicans* (Yücel and Kantarcıoğlu, 1999).

Molecular Identification

DNA extraction was performed using a commercial yeast DNA extraction kit (Yeast DNA Preparation Kit, Jena Bioscience, Germany). DNA samples were stored at -20 °C until use. The specific primers (*CALB1*) for the ITS region of *C. albicans*, were determined by BLAST (https://blast.ncbi.nlm.nih.gov/Blast.cgi) (Table 2). PCR was performed in 25 µl reaction mixture (5 µl target DNA, 12.5 µl PCR master mix (2X)

To cite this article: SAV O, ÖZTÜRK D. (2022). Determination of Virulence Factors in Candida albicans Isolated from Cattles with Mastitis. MAKU J. Health Sci. Inst., 10(1), 91-99.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

(Thermo Fisher Scientific, Inc., USA), 1 µl each primer (10 Mm), 5.5 µl ddH_2O) (Eldosouky et al 2016). An initial denaturation (at 95 °C, 5 min) was followed by 35 cycles containing denaturation in 94 °C, 1 min, annealing in 52 °C, 1 min and extention in 72 °C, 1 min and chain extension at 72 °C, 5 min. PCR products (5 µl) were stained with ethidium bromide in TAE (Thermo Scientific, USA) containing 1.5% agarose gel and visualized under the UV light (Edas 290, Eastman Kodak Company, Rochester, NY, USA). The bands in 273 bp were evaluated as *C. albicans* positive (Susever and Yegenoglu, 2012). *C. albicans* ATCC 90028 strain as positive control and sterile bidistile water as negative control in this study.

Detection of Virulence Genes

The amplification of *PLB1* gene was performed as described by Eldesouky et al (2016). In this study, it was used spesific primers for *PLB1* gene described by Mukherjee et al. (2001) (Table 2). Amplification was performed in 25 µl PCR reaction mixture containing 5 µl target DNA, 12.5 µl 2X master mix, 5.5 µl ddH_2O, 1 µl primer F (10 µM) and primer R (10 µM). Amplification was performed in an initial denaturation step at 94°C for 5 minutes and followed by 35 cycles (at 94 °C for 1 minutes, 47 °C for 1 minutes and at 72 °C for 1 minutes) and a final extention at 72 °C for 5 minutes).

Table 2. Primers coded *C. albicans* and virulence factors.

Target genes	Primer sequences	DNA sizes
CALB1	Forward 5'-TTTATCAACTTGTCACACCAGA-3' Reverse 5'-ATCCCGCCTTACCACTACCG-3'	273 bp
*PLB*1	Forward 5'-ATGATTTTGCATCATTTG-3' Reverse 5'-AGTATCTGGAGCTCTACC-3'	751 bp
*ALS*1	Forward 5'-GACTAGTGAACCAACAAATACCAGA-3' Reverse 5'-CCAGAAGAAACAGCAGGTGA-3'	318 bp

bp: base pair.

PCR for *ALS1* gene was done in 25 µl PCR reaction mixture (5 µl target DNA, 12.5 µl 2X master mix, 1 µl of primer F (10 µM) and primer R (10 (M), 5.5 µl ddH_2O) as described by İnci et al 2013. The spesific primer for *ALS1* was shown in Table 2. Amplification was done in an initial denaturation at 94°C for 4 minutes followed by 35 cycles (at 94 °C for 30 second, 52 °C for 1 minutes and at 72 °C for 2 minutes) and a final extention at 72 °C for 5 minutes.

PCR products were electrophoresed in 1.5 % agarose gel with ethidium bromide. *C. albicans* ATCC 90028 strain as positive control and sterile bidistile water as negative control were used.

Biofilm Formation

Biofilm production ability of *C. albicans* isolates were determined by tube adherens methods as described by Christensen et al (1995). A loop ful of *C. albicans* from the SDA was inoculated into tube containing sterile 10 ml TSB medium with glucose. The tubes were incubated at 37 °C, for 24 hours. At the end of this period, the tube contents were discharged into the jar with disinfectant, washed 3 times with phosphate buffer saline (PBS) (pH 7.2). Dried tubes were stained with 1% crystal violet for 3 hours. The stain was removed from tubes and the tubes were inverted and allowed to dry. Tubes were observed for biofilm formation. The presence of colored layers in the inner wall of the tubes was evaluated as "positive". Test was performed in twice and repeated for three times. *C. albicans* ATCC 90028 as positive control and sterile TSB as negative control were used.

To cite this article: SAV O, ÖZTÜRK D. (2022). Determination of Virulence Factors in Candida albicans Isolated from Cattles with Mastitis. MAKU J. Health Sci. Inst., 10(1), 91-99.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

Results

Isolation and Identification of C. albicans

Out of 686 milk samples, 49 (7.14 %) yeast isolates were detected in this study. The isolates were identified as *Candida* spp. to according cultural and morphological characteristics. 5 (10.20%) of yeast isolates were described as *C. albicans* by germ tube test and chlamydospore formation. While these isolates were shown blue-green color in Chromogenic agar, non-*C. albicans* isolates were shown pink color. Also, the isolates were growth in 45 °C.

Molecular Identification of C. albicans

The isolates identified by conventional methods as *C. albicans* were confirmed by using spesific gene (*CALB*1) encoded ITS region (Fig 1).

*ALS*1 and *PLB*1 genes were detected in 3 (60%) each of these isolates (Fig. 2,3). Only two isolates were included *PLB*1 and *ALS*1 genes. *PLB*1 and *ALS*1 genes were not determined in one isolates. Only one isolate was included *ALS*1 and 1 isolate *PLB*1gene.

Biofilm Results

Biofilm production was detected to be strict positive in 3 *C. albicans* isolates, weak in 1 isolate and negative in 1 isolate (Table 3).

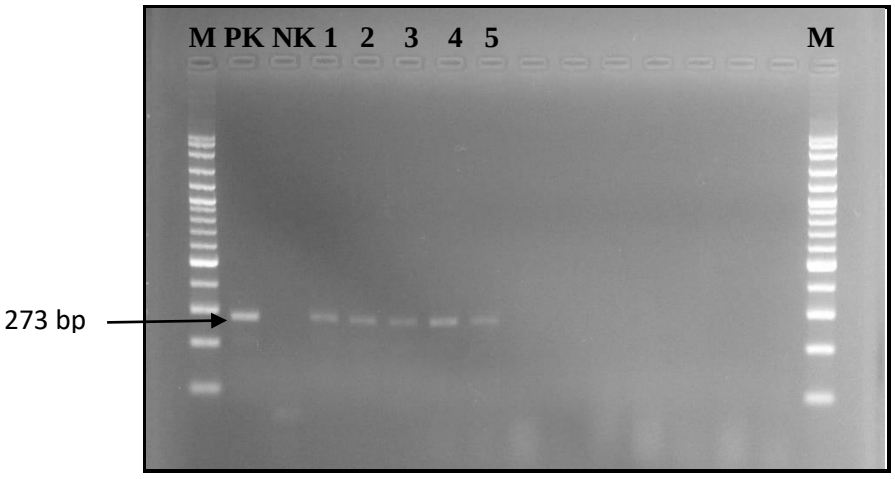

Figure 1. *CALB1* genes in *C. albicans* isolates [M: marker (100 bp); PC: positive control, *C. albicans* 90028 strain; NC: negative control, bidistilled water; 1-5: *C. albicans* isolates].

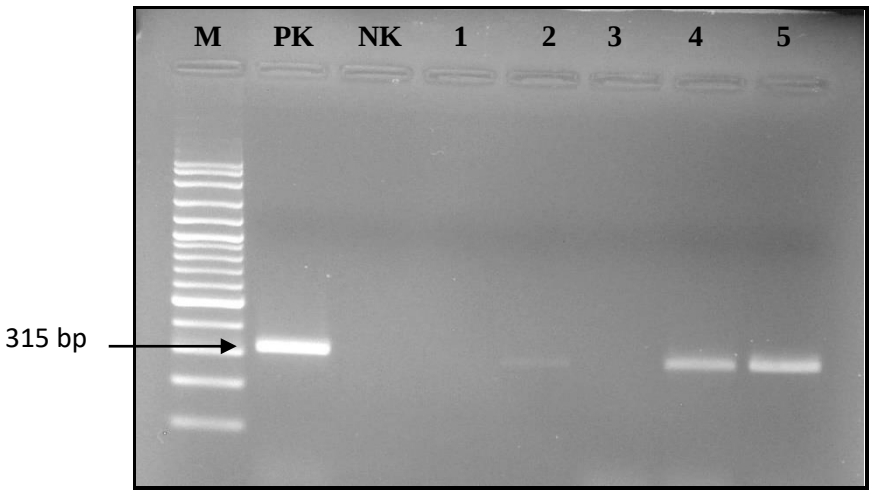

Figure 2. *ALS* genes in *C. albicans* isolates [M: Marker (100 bp); PC: Positive control, *C. albicans* 90028 strain; NC: Negative control, bidistilled water; 1,3: *ALS*1 negative *C. albicans* isolates; 2, 4-5: *ALS*1 positive *C. albicans* isolates].

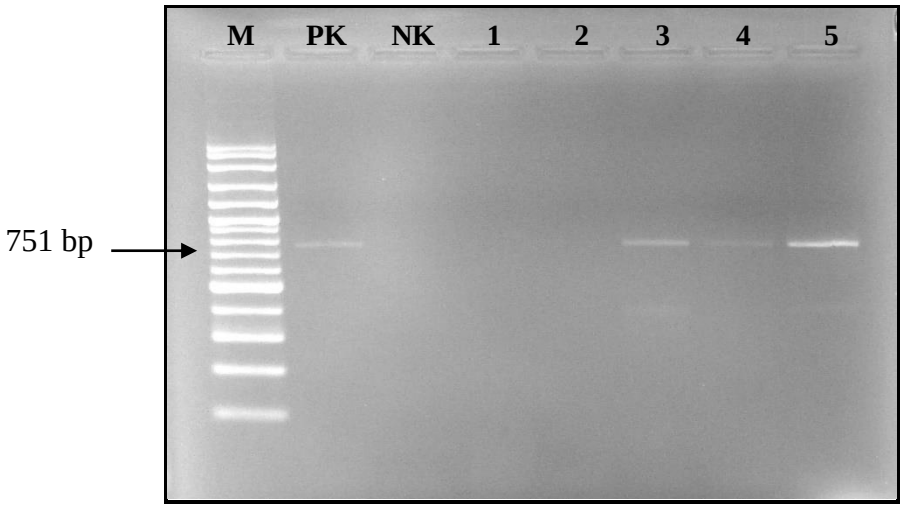

Figure 3. *PLB*1 genes in *C. albicans* isolates [M: Marker (100 bp); PC: Positive control, *C. albicans* 90028 strain; NC: Negative control, bidistilled water; 1-2: *PLB*1 negative *C. albicans* isolates, 3-5: *PLB*1 positive *C. albicans* isolates].

Table 3. Presence of biofilm formation and virulence genes in *C. albicans* isolates.

Isolates	***CALB*1**	***PLB*1**	***ALS*1**	**Biofilm**
1	+	-	-	+
2	+	-	+	+
3	+	+	-	+*
4	+	+	+	-
5	+	+	+	+
Total	**5 (100 %)**	**3 (60%)**	**3 (60%)**	**4 (%80)**

+: positive; -: negative *: weak positive

Discussion

C. albicans are often isolated from mycotic mastitis cases (Krukowski et al., 2000; Wawnon et al., 2010). In the present study, *Candida* spp. were isolated from 7.14% of milk samples. 10.20% of these isolates were identified as *C. albicans*. This rate was found to be compatible with the results of studies conducted in Turkey and other countries (Tarfarosh and Purohit, 2008; Krukowski et al., 2000; Şeker, 2010; Türkyılmaz and Kaynarca, 2010; Wawron et al., 2010; Costa et al., 2012; Sartori et al., 2014). Some researchers (Costa et al., 1993; Krukowski et al., 2000; Santos and Marin, 2005; Mousa et al., 2016; Eldesouky et al., 2016; Erbaş et al., 2017) have reported that mycotic mastitis rate was varied between 17.7-79.4%. *Candida* species, especially *C. albicans* exists as a flora bacteria in the skin, digestive and genital systems of humans and animals (Santos and Marin, 2005). Unhygienic conditions may be one of the reasons for the high incidence of mastitis caused by *Candida* species. However, contaminated antibiotic preparations, cannulas and injector applications, and antibiotic resistance due to long-term use of antibiotics in mastitis cases can lead to *Candida* mastitis (Dworecka Kaszak et al., 2012).

To cite this article: SAV O, ÖZTÜRK D. (2022). Determination of Virulence Factors in Candida albicans Isolated from Cattles with Mastitis. MAKU J. Health Sci. Inst., 10(1), 91-99.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

In this study, 5 of the *Candida* isolates were found positive by germ tube test and were identified as *C. albicans*. Presumptive identification of *C. albicans* is generally done by germ tube test (Madhavan et al., 2011; Quinn et al., 2011). The germ tube test, which is the fastest, simplest and cheapest test for distinguishing *C. albicans* from other *Candida* species, is the gold standard (Pincus et al., 2007; Byadarally-Raju and Rajappa, 2011). However, some researchers (Mackenzie, 1962; Lipperheide et al., 1993; Kadry et al., 2018) have reported that 5-10% of *C. albicans* isolates do not form germ tubes. In the present study, it was observed that other yeast isolates formed germ tube-like structures. *C. tropicalis* and *C. parapsilosis* can form germ tube-like hyphae and these hyphae show narrowing in the region where they extend from the mother cell, which is important in distinguishing it from *C. albicans* (Yücel and Kantarcıoğlu, 1999). 5 isolates identified as *C. albicans* by germ tube test were confirmed to be *C. albicans* by detection chlamidiophore formation.

The phenotypic characterization of *C. albicans* may cause problems due to morphological, biochemical similarities with other *Candida* spp. (Yücel and Kantarcıoğlu, 1999; Kadry et al., 2018). Therefore, in recent years, the identification of *C. albicans* has been done by molecular methods. In particular, PCR is the most commondiagnostic method and in the present study, 5 isolates identified by phenotypic methods as *C. albicans* confirmed using *C. albicans* spesific CALB primers.

ALS proteins are responsible for adhesion and biofilm formation and are encoded by 8 genes (Hoyer, 2001). *ALS*1 gene was detected in 3 (80%) of *C. albicans* isolates in this study. *ALS*1 gene is important for attachingto the host and biofilm formation in the early phase of *C. albicans* infection (Kamai et al., 2002; Green et al., 2004). It is thought that other ALS proteins or adhesion mechanisms may play a role in adhesion in *ALS* negative *C. albicans* isolates. However, it is reported that the detection rate of the HWP1 adhesion gene in milk samples of cattle with mastitis is higher than *ALS*1 gene (Mousa et al., 2016). *ALS*1 and *PLB*1 could not be detected in 1 of the *C. albicans* isolates in this study. This isolate of biofilm forming ability was weakly positive. These genes are the most important virulence factors of *C. albicans* (Calderone and Fonzi, 2001). Therefore, these *C. albicans* isolates could be found in the flora. As a matter of fact, isolation of *C. albicans* from healthy animals has been reported, but virulence factors could not be detected in these isolates (Türkyılmaz and Kaynarca, 2010; Mousa et al., 2016). In this study, it was determined that 3 isolates formed strong biofilms and one isolate formed weak biofilms. Studies have shown that ALS genes are associated with biofilm (Green et al., 2004; İnci et al., 2013). When the presence of *ALS*1 gene and biofilm formation were compared, it was determined that one of the 3 isolates that formed strong positive did not carry the *ALS*1 gene. This could be explained by the presence of other ALS genes (Mousa ve ark., 2016).

There are several studies were reported that *PLB*1 gene was detected in all *C. albicans* isolates obtained from cows with clinical mastitis (Eldesouky et al., 2016; Mousa et al., 2016). Hakim et al (2013) were reported the presence of *PLB*1 gene in 5 *C. albicans* isolated from Kareish cheeses and Eldesouky et al (2016) were detected in all *C. albicans* isolates (n:4) isolated from bovine mastitis. Although the *PLB*1 gene was reported in *C. albicans* isolated from milk with mastitis, it was detected in only 3 of the *C. albicans* isolates. It has been reported that the *PLB*1 gene is an important virulence factor of *C. albicans*, and the virulence of the infection decreases when the mutant strains obtained by deletion of this gene are given to animals (Mukherjee ve ark, 2001).

In conclusion, the presence of *ALS*1 and *PLB*1 genes, which are important virulence genes, were detected in *C. albicans* isolated from milk samples with mastitis for the first time in Turkey. Also, it was determined that PCR was the fastest, most reliable and inexpensive method for the identification of *C. albicans*. Virulence factors detected in *C. albicans* isolates isolated from milk with mastitis were also detected in strains isolated

To cite this article: SAV O, ÖZTÜRK D. (2022). Determination of Virulence Factors in Candida albicans Isolated from Cattles with Mastitis. MAKU J. Health Sci. Inst., 10(1), 91-99.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

from humans. This situation shows that these microorganisms can be transmitted to humans through raw milk and dairy products and cause public health problems.

Acknowledgements

This research was supported by Burdur Mehmet Akif Ersoy University Scientific Research Projects Coordination Unit with 0465-YL-17 project number.

References

Arda, M., 2015. *Temel Mikrobiyoloji,* 5. baskı, Medisan Yayınevi, Ankara, s: 14-359.

Byadarahally-Raju, S., Rajapp,a S., 2011. Isolation and identification of *Candida* from the oral cavity. International Scholarly Research Network Dentistry (Doi:10.5402/2011/487921).

Calderone, R.A., Fonzi, W.A., 2001. Virulence factors of *Candida albicans***.** Trends Microbiology, 9, 327-335.

Christensen, G.D., Simpson, W.A., Younger, J.A., 1995. Adherence of coagulase negative Staphylococci to plastic tissue cultures: a quantitative model for the adherence of Staphylococci to medical devices. Journal of Clinical Microbiology, 22, 996-1006.

Costa, E.O., Gandra, C.R., Pires, M.F., Coutinho, S.D., Castilho, W., Teixeira, C.M., 1993. Survey of bovine mycotic mastitis in dairy herds in the State of Silo Paulo, Brazil. Mycopathologia, 124**,** 13-17.

Costa, G.M., Pereira, U.P., Souza-Dias, M.A.G., Silva, N., 2012. Yeast mastitis outbreak in a Brazilian dairy herd. Brazilian Journal of Veterinary Research Animal Science*,* 49, 239-243

Dworecka-Kaszak, B., Krutkiewicz, A., Szopa, D., Kleczkowski, M., Biegańska, M., 2012. High prevalence of *Candida* yeast in milk samples from cows suffering from mastitis in Poland. The Scientific World Journal, (Doi:10.1100/2012/196347).

Eldesouky, I., Mohamed, N., Khalaf, D., Salama, A., Elsify, A., Ombarak, R., El-Ballal, S., Effat, M., Shabrawy, M.A.L., 2016. *Candida* mastitis in dairy cattle with molecular detection of *Candida albicans*. Kafkas Universitesi Veteriner Fakültesi Dergisi, 22, 461-464.

Erbaş, G., Parın, U., Kırkan, Ş., Savaşan, S., Özavcı, M.V., Yüksel, H.T., 2017. Identification of *Candida* strains with nested PCR in bovine mastitis and determination of antifungal susceptibilities. Turkish Journal of Veterinary Animal Science, 41, 757-763.

Green, C.B., Cheng, G., Chandra, J., Mukherjee, P., Ghannoum, M.A., Hoyer, L.L., 2004. RT-PCR detection of *Candida albicans ALS* gene expression in the reconstituted human epithelium (RHE) model of oral candidiasis and in model biofilms. Microbiology, 150, 267-275.

Hakim, A.S., Abuelnaga, S.M., Sayed, El Ahl M.H., 2013. Isolation, biochemical identification and molecular detection of yeasts from Kareish cheese. International Journal of Microbiology Research., 4, 95-100.

Hoyer, L.L., 2001. The ALS gene family of *Candida albicans*. Trends Microbiology, **9,** 176-180.

İnci, M., Atalay, M.A., Özer, B., Evirgen, Ö., Duran, N., Köksaldı-Motor, V., Koç, A.N., Önlen, Y., Kılınç, Ç., Durmaz, S., 2013. Investigations of *ALS*1 and *HWP*1 genes in clinical isolates of *Candida albicans*. Turkish Journal of Medicine Science, 43, 125-130.

Kadry, A.A., El-Ganiny AM, El-Baz A.M., 2018. Relationship between Sap prevalence and biofilm formation among resistant clinical isolates of *Candida albicans*. African Health Science, 18, 1166-1174.

Kamai ,Y., Kubota, M., Kamai, Y., Hosokawa, T., Fukuoka, T., Filler, S.G., 2002. Contribution of *Candida albicans ALS*1 to the pathogenesis of experimental oropharyngeal candidiasis. Infection and Immunity, 70**,** 5256-5258.

Krukowski, H., Tietze, M., Majewski, T., Rózański, P., 2001. Survey of yeast mastitis in dairy herds of small-type farms in the Lublin region, Poland**.** Mycopathologia, 150, 5-7.

Lipperheide, V., Andraka, L., Pontón, J., Quindós, G., 1993. Evaluation of the albicans IDR plate method for the rapid identification of *Candida albicans*. Mycoses**, 36,** 417-420.

Mackenzie, D.W.R., 1962. Serum tube identification of *Candida albicans*. Journal of Clinical Pathology*,* 15, 563-565.

Madhavan, P., Jamal, F., Chong, P.P., 2011. Laboratory isolation and identification of *Candida* species. Journal of Applied Science, 11, 2870-2877.

Marinho, S.A,, Teixeira, A.B., Santos, O.S,, Cazanova, R.F,, Ferreira, C.A.S., Cherubini, K., Oliveira, S.D., 2010. Identification on *Candida* spp. by phenotypic tests and PCR. Brazilian Journal of Microbiology, 41, 286-294.

Mousa, W., Elmonir, W., Abdeen 2016. Molecular typing, virulence genes and potential public health implications of *Candida albicans* isolated from bovine milk. Japanese Journal of Veterinary Research, 64**,** 211-215.

Mukherjee, P.K., Seshan, K.R., Leidich, S.D., Chandra, J., Cole, G.T., Ghannoum, M.A., 2001. Reintroduction of the *PLB*1 gene into *Candida albicans* restores virulence in vivo. Microbiology*,* 147, 2585-2597.

Navarro-García, F., Sánchez, M., Nombela, C., Pla, J., 2001. Virulence genes in the pathogenic yeast *Candida albicans*. FEMS Microbiology*,* 25, 245-268.

Pachauri, S., Varshney, P., Dash, S.K., Gupta, M.K. 2013. Involvement of fungal species in bovine mastitis in and around Mathura, India. Veterinary World, 6**,** 393-395.

Pincus, D.H., Orenga, S., Chatellier, S., 2007. Yeast identification - past, present, and future methods. Medical Mycology*.,* 45, 97-121.

Quinn, P.J., Markey, B.K., Leonard, F.C., Hartigan, P., Fanning, S., Fitzpatrick, E.S. 2011. *Veterinary Microbiology and Microbial Diseases*, 2nd edt, John Wiley and Sons Ltd, United State, p: 413-483.

Santos, R.C., Marin, J.M., 2005. Isolation of *Candida* spp. from mastitic bovine milk in Brazil. Mycopathologia*,* 159, 251-253.

Sartori, L.C.A., Santos, R.C., Marin, J.M., 2014. Identification of *Candida* species isolated from cows suffering mastitis in four Brazilian states. Arquivo Brasileiro de Medicina Veterinária e Zootecnia*,* 66, 1615-1617.

Schmitt, J.A., 1971. Epidemiological investigations of oral *Candida albicans*. Mycopathologia et Mycologia Applicata, 43**,** 65-87.

Susever, S., Yeğenoğlu, Y., 2012. İmmün sistemi baskılı hastaların klinik örneklerinden soyutlanan *Candida* türlerinin PCR ile belirlenmesi ve antifungal direnç genlerinin RFLP ve sekans analizi ile saptanması. Dicle Tıp Dergisi, 39**,** 242-250.

Şeker, E., 2010. Identification of *Candida* species isolated from bovine mastitic milk and their in vitro hemolytic activity in Western Turkey. *Mycopathologia.,* 169, 303-308.

Şeker, E., Özenç, E., 2011. In vitro biofilm activity of *Candida* species isolated from Anatolian buffaloes with mastitis in Western Turkey. Veterinarski Arhiv, 81, 723-730.

Tarfarosh, M.A., Purohit, S.K., 2008. Isolation of *Candida* spp. from mastitic cows and milkers. VetScan, 2, 14-15.

Tarini, N.M.A., Wahid, M.H., Ibrahim, F., Yasmon, A., Djauzi, S., 2010. Development of multiplex-PCR assay for rapid detection of *Candida* spp. Medical Journal of Indonesia*,* **19,** 83-87.

Türkyılmaz, S., Kaynarca, S., 2010. The slime production by yeasts isolated from subclinical mastitic cows. Acta Veterinaria Brno, 79, 581-586.

Wawron, W., Bochniarz, M., Dąbrowski, R., 2010. Antifungal susceptibility of yeasts isolated from secretion of inflamed mammary glands in cows. Poland Journal of Veterinary Science, 13, 487-490.

Yücel, A., Kantarcıoğlu, S., 1999. Some important changes in taxonomy of *Candida albicans*. Cerrahpaşa Medical Journal, 30, 236-246.

To cite this article: SAV O, ÖZTÜRK D. (2022). Determination of Virulence Factors in Candida albicans Isolated from Cattles with Mastitis. MAKU J. Health Sci. Inst., 10(1), 91-99.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

MAKU J. Health Sci. Inst. 2022, 10(1): 100-103.
doi: 10.24998/maeusabed.1095874

Mehmet Akif Ersoy University
Journal of Health Sciences Institute
http://dergipark.gov.tr/maeusabed

Case Report / Vaka Sunumu

Severe Tongue Necrosis due to Pine Processionary Larvae Contact in Three Dogs

Üç Köpekte Çam Kesesi Larva Teması Nedeniyle Şiddetli Dil Nekrozu

Mehmet Çağrı KARAKURUM[1*], Şima ŞAHİNDURAN[1], Özlem BİÇİCİ[2], Reyda KIYICI[3]

[1]Burdur Mehmet Akif Ersoy University, Faculty of Veterinary Medicine, Department of Internal Medicine, Burdur, Turkey
[2]Siirt University, Faculty of Veterinary Medicine, Department of Internal Medicine, 56100, Siirt, Turkey.
[3]Burdur Mehmet Akif Ersoy University, Burdur Food, Agriculture and Livestock Vocational School, 15030, Burdur, Turkey.

Abstract: Contact with the larvae of the pine processionary constitutes severe allergic reactions both in humans and animals. This study was aimed to reports clinical sings, treatment and prognosis in the three dogs who were in acute phase that contacted to pine processionary larvae. The clinical sigs included excessive salivation, halitosis and oedema, and necrosis of the tongue. Treatment was started immediately and necrotic areas disappeared. However, tissue loss was seen in the tongue during follow-up.

Keywords: Pine processionary larvae, dog, tongue necrosis.

Öz: Çam kese böceği larvaları ile temas, hem insanlarda hem de hayvanlarda ciddi alerjik reaksiyonlar oluşturur. Bu çalışmanın amacı, çam kese larvaları ile temas eden akut fazdaki üç köpeğin klinik belirtileri, tedavi ve prognozunu anlatmaktı. Klinik belirtiler arasında aşırı tükürük salgısı, ağız kokusu ve ödem ve dilin nekrozu vardı. Hemen tedaviye başlandı ve nekrotik alanlar kayboldu. Ancak takiplerinde dilde doku kaybı görüldü.

Anahtar Kelimeler: Çam kese böceği larvası, köpek, dil nekrozu.

*Corresponding author : M. Çağrı KARAKURUM e-mail : mckarakurum@mehmetakif.edu.tr
Geliş tarihi / Received : 30.03.2022 Kabul tarihi / Accepted: 25.04.2022

Introduction

The pine processionary is a member of the Lepidoptera species and family Notodontidae. Caterpillars of the pine processionary moth (PPM) Among approximately 200 species of Lepidoptera *Thaumetopoea wilkinsoni (Th. Wilkinsoni)* and *Thaumetopoea pityocampa (Th. Pityocampa)* are being the most common (Vega et al., 1999). *Th. pityocampa* is seen in central and western Mediterranean countries, while *Th. wilkinsoni* occurs in the Near East and Turkey (Bruchim et al., 2005, Yildar and Güzel, 2013). Members of this species live in pines and can harm pine trees, humans, and animals and have been described to be the most relevant allergens in Europe with allergenic properties they have (Rodriguez-Mahillo et al., 2012; Vega et al., 1999).

The larvae have five different stages however, the L4 and L5 stages are causing the disease. In the last two stages, the larvae have hairs containing chitinous spines that can penetrate the epidermis and cause dermatitis and other clinical signs (Bruchim et al., 2005). The spines of larval hair contain at least seven irritant allergens, a toxic protein called thaumetopoein is the most important (Lamy et al., 1986; Rodriguez-Mahillo et al., 2012). Thaumetopoein has a effect on mast cells that cause IgE independent degranulation which is responsible for the caterpillar's urticaria-forming ability (Lamy et al., 1986).

The symptoms may vary according to the direct contact with the larvae, ingestion of larvae, and inhaling the toxic substance. Direct contact may lead to several symptoms and disorders like urticaria, edema, conjunctivitis, temporary blindness, hypertension, and anaphylaxis.

To cite this article: KARAKURUM MÇ, ŞAHİNDURAN Ş, BİÇİCİ Ö, KIYICI R.. (2022). Severe Tongue Necrosis due to Pine Processionary Larvae Contact in Three Dogs. MAKU J. Health Sci. Inst., 10(1), 100-103.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

Ingestion of the larvae causes edema of the tongue and frenulum, vesicles, abdominal pain, vomiting, gastritis, and enteritis. Inhaling the toxic and irritant substance causes dyspnea, rhinopharyngitis, and bronchitis (Bruchim et al., 2005; Lamy et al., 1986; Yildar and Güzel, 2013). In dogs, the most reported clinical sign is tongue edema and necrosis, ptyalism, vomiting, dyspnoea, hyperthermia, hypovolemia, and diarrhea (Bruchim et al., 2005; Niza et al., 2008; Pouzot-Nevoret et al., 2017). Ocular lesions, such as keratitis anterior uveitis, were also reported (Costa et al., 2016).

In the present case report, clinical evaluation, treatment, and outcome of three dogs exposed to pine processionary larvae were described.

Case Presentation

The material of this case report consisted of 3 dogs [One Husky (Female, 6-month-old), 1 Kangal (Female, 3-year-old), and one Pointer (Female, 22 month-old)] brought to the Burdur Mehmet Akif Ersoy University, Faculty of Veterinary Medicine, Department of Internal Medicine between April and May 2017, with a complaint of dysphagia, salivation, and lethargy. In the history from the owners, there was a contact with pine processionary larvae on the ground.

Clinical examinations revealed body temperature 38.7-39.9 ◦C, excessive salivation, and halitosis in dogs (Fig.1, Fig. 2, Fig.3,). The tip of the tongue was necrotic in all three dogs. One dog also had facial oedema. Other physical findings were normal. Blood samples was obtained from all dogs and hematologic and biochemical analyses were performed. ALP and AST values were high in all three dogs, and WBC values were high only in the six-month-old Husky.

Figure 1. Excess salivation and lesion on the tongue

Figure 2. Lingual necrosis 24h after contact with Pine Processionary Larvae

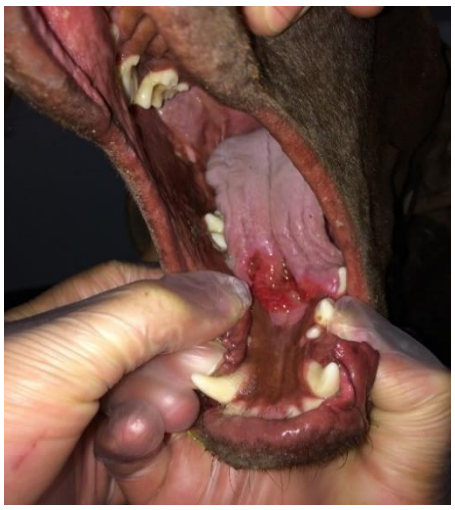

Figure 3. Necrosis on the tip of the tongue

To cite this article: KARAKURUM MÇ, ŞAHİNDURAN Ş, BİÇİCİ Ö, KIYICI R.. (2022). Severe Tongue Necrosis due to Pine Processionary Larvae Contact in Three Dogs. MAKU J. Health Sci. Inst., 10(1), 100-103.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

The treatment adapted from the literature (Yildar and Güzel, 2013) consists of flushing the oral cavity to remove the larvae hairs in the mouth was done using 0.9% saline solution. Systemic antihistaminic (Pheniramine hydrogen maleate, 0.5 mg/ kg, intramuscularly (IM) BID) and corticosteroids (dexamethasone, 0,3 mg/kg, intravenously (IV) were administered for 3 days. All dogs also received ceftriaxone sodium (25 mg/kg, IV BID) to prevent a possible infection. To promote the healing of the necrotic areas, dexpanthenol (11 mg/kg, IM,), an oral antiseptic (10% Glycerin iode BID), and lidocaine gel was also administered. An IV balanced solution with 5% dextrose was given to all dogs when necessary.

The follow-up clinical examination carried out a week later showed remission of the oedema and necrosis in the tongue. On the seventh and 14th days after treatment cessation, it was observed that the lesions in the tongue regressed, and the complete healing was in the 4th week, but there was tissue loss in the tongues (Fig.4.).

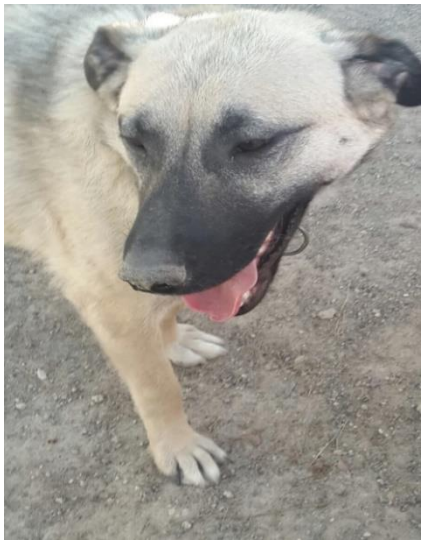

Figure 4. Note the tissue loss on tip of the tongue

Discussion

Toxic protein thaumetopoein can produce a strong inflammatory reaction on the skin and mucous membranes after contact with pine processionary larvae. Envenomation affects humans and animals (Kozer et al., 1999; Niza et al., 2008,). As reported previously (Bruchim et al., 2005, Niza et al., 2008, Pouzot-Nevoret et al., 2017) pine processionary larvae exposure in dogs primarily occurs between March and April. However, one study showed that the months of presentation from ranged January to September (Pouzot-Nevoret et al., 2017). Consistent with the results of previous studies our cases were admitted to our hospital in April (two cases) and May (one case).

The clinical signs of pine processionary larvae occur from mechanical irritation by contact with the larvae hair and the following release of thaumetopoein (Rodriguez-Mahillo et al., 2012). In our case report, clinical signs were acute lingual and gingival oedema, ulceration, and necrosis. Tongue edema may evolve within hours to tongue necrosis in severe cases (Grundmann et al., 2000; Niza et al., 2008; Parlatir and Erdoğan, 2018; Pouzot-Nevoret et al., 2017; Yildar and Güzel, 2013). Such lesions should be kept in mind in animals with excessive ptyalism. One report (Pouzot-Nevoret et al., 2017) stated that this sign strongly correlates with tongue injuries. Since accidental secondary hypersensitivity reaction had been reported in veterinary staff following contact with exposed animals (Bruchim et al., 2005), wearing gloves is important to protect the veterinarians and staff when treating or exploring the cause of excess salivation in dogs.

In the present case report, one dog had a rectal temperature above 39.9 °C. However, the other two dogs were normothermic. Hyperthermia is related to systemic inflammatory reaction caused by thaumetopoein (Rodriguez-Mahillo et al., 2012), and is associated with more severe tongue lesions (Pouzot-Nevoret et al., 2017). Similar to those reports hyperthermic dogs had severe tongue necrosis.

Results of previous studies (Niza et al., 2008; Costa et al., 2016), showed that ocular lesions were rare. Parallel with these results no ocular lesions were seen at admission or during treatment in our case report. However, an ophthalmic examination should be performed despite the low prevalence of ocular lesions.

The recommended treatment for the animals exposed to a pine processionary larvae consists of flushing of skin and mucosa may have come in contact and use of corticosteroids and antihistaminics to prevent inflammatory reactions (Kaszak et al., 2015, Pouzot-Nevoret et al., 2017). Oral flushing, in cases of ingestion and tongue

To cite this article: KARAKURUM MÇ, ŞAHİNDURAN Ş, BİÇİCİ Ö, KIYICI R.. (2022). Severe Tongue Necrosis due to Pine Processionary Larvae Contact in Three Dogs. MAKU J. Health Sci. Inst., 10(1), 100-103.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.

involvement, was allowed the preservation of the tongue tissue. However, a delay in oral flushing after pine processionary larvae contact by more than 6 hours increases the risk of tongue necrosis (Pouzot-Nevoret et al., 2017). Although there was a delay in admission to the hospital more than 6 hours in the present case report, flushing of the oral cavity was performed in all 3 dogs. Tongue necrosis was present in all dogs. For this reason, the effect of irrigating the oral cavity on preventing the development of necrosis is unknown.

Pain control may alleviate discomfort and promote food intake (Bruchim et al., 2005). All three dogs in the present case report received pain medication topical anaesthetics (lidocaine).

Anaphylaxis or degree of tongue necrosis may affect prognosis. However, the prognosis for dogs was reported to be generally good to fair. In the present case report, the survival rate was 100%. During follow-ups, no dogs had a sequela or complication. Similar to the other reports (Niza et al., 2008; Parlatir and Erdoğan, 2018; Pouzot-Nevoret et al., 2017; Yildar and Güzel, 2013), the prognosis for dogs exposured to pine processionary larvae was good in the present report's cases.

In conclusion, it was observed that pine processionary larvae caused severe necrosis of the tongue in dogs, however, these necrotic areas disappeared with appropriate treatment, but tissue loss may occur in the tongue.

Acknowledgement

This study was presented at 1. International Turkey Veterinary Internal Medicine Congress, Antalya, 2017.

References

Bruchim Y., Ranen E., Saragusty J., Aroch I., 2005. Severe tongue necrosis associated with pine processionary moth (Thaumetopoea wilkinsoni) ingestion in three dogs. Toxicon 45, 443–447.

Costa D., Esteban J., Sanz F., Vergara J., Huguet E., 2016. Ocular lesions produced by pine processionary caterpillar setae (Thaumetopoea pityocampa) in dogs: a descriptive study. Veterinary Ophthalmology 19, 493–497.

Grundmann S., Arnold P., Montavon P., 2000. Toxische Zungennekrose nach Kontakt mit Raupen des Pinienprozessionsspinners (Thaumetopoea pityocampa Schiff.). Kleintierpraxis 45, 45–50.

Kaszak I., Planellas M., Dworecka-Kaszak B., 2015. Pine processionary caterpillar, Thaumetopoea pityocampa Denis and Schiffermüller, 1775 contact as a health risk for dogs. Annals of Parasitology 61, 159 – 163.

Kozer E., Lahat E., Berkovitch M., 1999. Hypertension and abdominal pain: uncommon presentation after exposure to a pine caterpillar. Toxicon 37, 1797-1801.

Lamy M., Pastureaud M.H., Novak F., Ducombs G., Vincendean P., Malerille J., Texier L., 1986. Thaunetopoein: an urticating protein from the hairs and integument of the pine processionary caterpillar (Thaumatopoea pityocampa Schiff). Toxicon 24, 347–356.

Niza M.E., Ferreira R.L., Coimbra H.M., Guerreiro N.M., Felix J.M., Matos T.V., Vilela C.L., 2008. Effects of Pine Processionary Caterpillar Thaumetopoea pityocampa Contact in Dogs: 41 Cases (2002–2006). Zoonoses and Public Health 59, 35-38.

Parlatir Y., Erdoğan H., 2018. Bir Köpekte Eroziv Ülseratif Stomatitis: Çam Kesesi Böceği Toksikasyonu. Journal of advances in vetbio science and techniques 3, 44-49.

Pouzot-Nevoret C., Cambournac M., Viole A., Goy-Thollot I., Bourdoiseau G., Barthelemy A., 2017. Pine processionary caterpillar Thaumetopoea pityocampa envenomation in 109 dogs: A retrospective study. Toxicon 132, 1-5.

Rodriguez-Mahillo A.I., Gonzalez-Munoz M., Vega J.M., Lopez J.A., Yart A., Kerdelhue C., Camafeita E., Garcia Ortiz J.C., Vogel H., Toffolo E.P., Zovi D., Battisti A., Roques A., Moneo I., 2012. Setae from the pine processionary moth (Thaumetopoea pityocampa) contain several relevant allergens. Contact Dermatitis 67, 367–374.

Vega J.M., Moneo I., Armentia A., Fernandez A., Vega J., De La Fuente R., Sanchez P., Sanchis M.E., 1999. Allergy to the pine processionary caterpillar (Thaumetopoea pityocampa). Clinical and Experimental Allergy 29, 1418–1423.

Yildar E., Güzel Ö., 2013. Tongue necrosis in a dog associated with the pine processionary caterpillar and its treatment. Turkish Journal of Veterinary and Animal Sciences, 37, 238-241

To cite this article: KARAKURUM MÇ, ŞAHİNDURAN Ş, BİÇİCİ Ö, KIYICI R.. (2022). Severe Tongue Necrosis due to Pine Processionary Larvae Contact in Three Dogs. MAKU J. Health Sci. Inst., 10(1), 100-103.

ISSN: 2148-2837/ MAKU J. Health Sci. Inst.